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INDIA RUBBER WORLD

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Volume 100 | July 1, 1939 | Number 4

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Published monthly by Bill Brothers Publishing Corp., 420 Lexington Ave., New York, N. Y. Address, ELBILL, New York, Subscription $3 per year postpaid in the United States and Mexico; $3.50 per year postpaid to Canada; $4.00 per year postpaid to all other countries.

A BILL BROTHERS PUBLICATION

Other Bill publications are: *Premium Practice, Rug Profits, Sales Management, Soda Fountain,* and *Tires.*

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Published at 420 Lexington Avenue, New York, N. Y.

Volume 100 — **New York, July 1, 1939** — **Number 4**

Effect of Particle Size on Heat Generating Properties of Carbon Black in Tread Stocks

G. L. Roberts [1]

AN IMPORTANT factor in the service of a tire tread is its ability to resist fatigue when subjected to flexing under compressive loads, thereby minimizing the possibility of blowout. The life of a tread stock is limited by the heat generation or "build up" during service. Heat has a deteriorating effect upon rubber compounds and is often sufficient to cause decomposition of the compound to such an extent that the stock completely breaks down with an actual blowout. This condition is brought about by high temperatures developed in the interior of the stock and by the expansion of liquids and/or gaseous materials, which are formed due to the generated heat. The expansion of the liquid and/or gaseous materials causes a rupture of the wall of the rubber compound. Heat generation in tread stocks has always been a serious problem and has, during the past few years, become one of great importance in the rubber research laboratory. This is particularly true not only for tread stock designed for passenger tires, but even more so for tread stocks compounded for truck service. Tread stocks designed for truck service are subjected to greater flexing under greater compression loads; therefore their ability to resist fatigue is much less than a tire which is being run in passenger-car service.

Many investigators have studied the effect of heat generation in rubber compounds, and a few have designed special machines to enable a more careful and accurate study of heat generation effects in reference to blowout.

In 1933, Cooper[2] studied the evaluation of fatigue of rubber compounds flexed under compression. Compounds containing two different loadings of carbon black were used. Although the amount of heat generated was not recorded, the results evidenced that, with the higher loaded carbon black stocks, it took a much shorter time to reach the deformation point than with those stocks containing lower carbon black loadings. Further work on the breakdown and blowout characteristics of rubber compounds was carried out by Havenhill and MacBride,[3] who investigated this effect on zinc oxide stocks.

In 1937, Lessig[4] developed a new form of hysteresis test and observed the effect of different volume loadings of carbon black in relation to heat generation in rubber compounds. He studied heat generation as related to time within a set flexing cycle, and also the change in height of the stock during the period of flexing. The results obtained by these studies evidenced that with increased loadings of carbon black more heat was generated within close periods of time during flexing with a progressive change in height.

The work that has been done to date has resulted in only very limited information pertaining to the effect that different types of carbon black have on heat generation in tire tread stocks in reference to blowout. Of the different rubber grades of channel black which exhibit differences in their physical characteristics, each imparts to rubber compounds specific properties that vary, in some instances, quite widely, but the effect on heat generation in tread stocks fluctuates within set limitations according to the grade used. Rubber compounds pigmented with carbon black produced by the channel process have a greater tendency to generate heat than other types of pigmented stocks when subjected to flexing under compressive loads. However to minimize materially this relative effect, through the medium of compounding, would present a greater

[1] Chief chemist, United Carbon Co., Inc., Charleston, W. Va.
[2] *Ind. Eng. Chem., Anal. Ed.*, 5, 5, 350 (1933).
[3] *Ibid.*, 7, 1, 60 (1935).
[4] *Ibid.*, 9, 12, 582 (1937).

problem in the sacrificing of road wear. In evaluating a carbon black of the high reenforcing type, such as channel black, for tread stocks designed especially for truck service consideration should be given to some extent to the effect of heat generation in conjunction with the other properties definitely required.

To this study the development of fatigue machines used for evaluating stocks for heat generation and blowout has given the rubber chemist a much better yardstick for measuring such values. The results obtained in the laboratory with these particular types of fatigue machines have been closely correlated with results obtained on tires in service and road test.

Sample Preparation

Four grades of carbon black produced by the channel process and representing a distinct difference in their physical characteristics were used. These four grades ranged from a relatively large particle-size carbon black to a relatively small-size particle as found in the general range of carbon blacks produced especially for tread stock compounding. The four grades exhibited a marked differential in their rate of cure and reenforcing properties as well as a difference in resistance to abrasion and hardness when compounded in a tread stock recipe.

Carbon black A is a slow curing type, representing a relatively small particle size. Carbon black B is a medium rate of cure product having a relative larger particle size than sample A. Carbon black C is a fast curing type having a relative particle size larger than sample B. Carbon black D is a medium rate of cure having, relatively speaking, the largest particle size of the four samples used.

The carbon blacks, A, B, C, and D, were compounded in the following tread stock test recipe and evaluated as to the properties presented.

Rubber (smoked sheet)	100.00
Carbon (gas) black	50.00
Stearic acid	4.00
Pine tar	3.50
Zinc oxide	5.00
Mercaptobenzothiazole	0.75
Phenyl-beta-naphthylamine	1.00
Sulphur	3.00
	167.25

The stocks were mixed in a Banbury type of internal mixer: all ingredients were added except the sulphur which was admixed on the mill.

Stress-Strain Results

The stress-strain results obtained on the four samples (Table 1) evidenced a distinct difference in these values for the four samples. However the rate of cure, as determined by the T-50 test,[5] evidenced a much sharper differentiation between the slow curing, medium curing, and fast curing carbon blacks.

Hardness and Abrasion

The stocks containing the four different grades of carbon black showed a marked difference in hardness and resistance to abrasion (Table 2).

Sample D, although a medium rate of cure black and having relatively the largest particle size, exhibited the lowest degree of hardness and offered the least resistance to abrasion, therefore evidencing that rate of cure is not a criterion for evaluating other important properties of carbon black.

[5] *Ibid.*, 5, 4, 279 (1933).

Table 1

Sample	Min. at 30 Lbs.	A	B	C	D
Modulus at 300%	30	650	735	760	745
	60	1145	1240	1255	1215
	90	1405	1520	1565	1505
	120	1510	1675	1725	1640
Modulus at 500%	30	1760	1985	2070	1970
	60	2740	2910	2980	2885
	90	3200	3350	3475	3310
	120	3360	3510	3615	3475
Tensile Strength	30	3800	3725	3700	3450
	60	4480	4350	4300	4150
	90	4575	4300	4250	4100
	120	4450	4260	4100	4050
Elongation at Break	30	741	705	708	680
	60	670	642	637	621
	90	628	590	583	562
	120	600	562	550	528
T-50	30	+ 8.3	+ 7.2	+ 4.0	+ 7.0
	60	— 1.6	— 4.2	— 6.9	— 3.9
	90	— 8.0	—10.9	—13.7	—10.6
	120	—12.0	—15.1	—17.9	—14.8

Table 2

Sample	Min. at 30 Lbs.	A	B	C	D
Hardness*	30	72.6	75.8	77.3	82.0
	60	49.4	51.5	52.8	54.5
	90	42.5	43.0	44.2	45.8
	120	41.6	42.0	42.3	43.0
Resistance to Abrasion†					
Green Stocks					
CC Loss/HPH‡	30	336	343	362	392
	60	185	194	212	260
	90	155	159	166	185
	120	147	152	160	180
Aged Stocks¶					
CC Loss/HPH‡	30	403	412	428	467
	60	326	332	343	379
	90	305	316	322	364
	120	296	307	310	350

*Olsen-type durometer, using three-pound dead weight.
†Testing machine, Grasselli (Du Pont), using a Norton-type Crystalon wheel, Grade J, Grain 3746.
‡Horsepower hour.
¶Stocks aged for 48 hours in a Bierer-Davis type of bomb at 300 lbs. pressure oxygen/70° C.

Heat Generation

In studying the effect the four different samples had on the heat generation of the stocks the Goodrich-type flexometer (Figure 1A) with the described constant temperature oven[4] was used. The stroke was standardized at 0.25-inch using a 200 lb./sq. in. compression load with an eccentric speed of 1800 r.p.m. and the oven maintained at 100° F. The test pieces were prepared from cured blocks one inch by 2 inches by 2¾ inches using a drill press equipped with a slotted die. (Figure 1B.) The test piece was cylindrical in shape with a diameter of 0.7-inch and a height of one inch.

The 60- and 90-minute cures were selected as the range for the test. Tests on

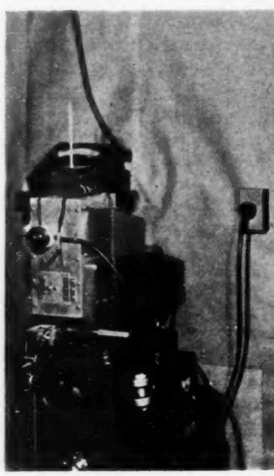


Fig. 1A. Goodrich Type of Flexometer with Constant Temperature Oven

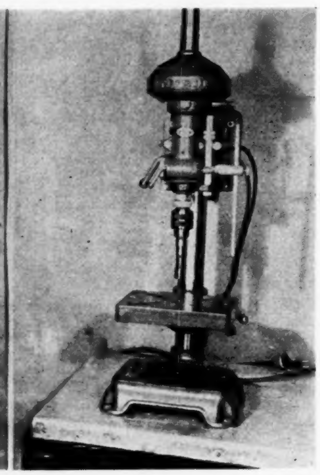


Fig. 1B. Drill Press with Slotted Die for Preparing Test Pieces

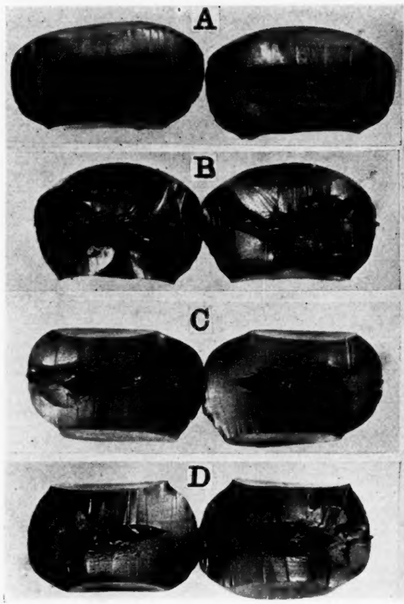


Fig. 2. Unaged Specimens

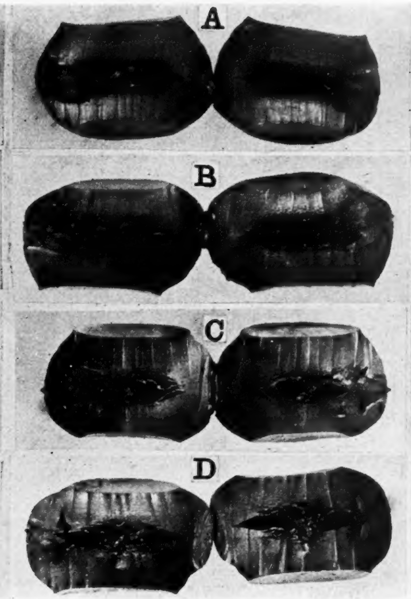


Fig. 3. Specimens Aged 168 Hours in Constant Temperature Room at 82° F. and 45% R.H.

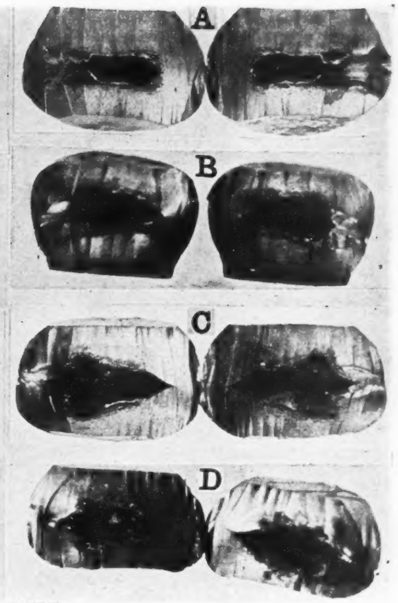


Fig. 4. Specimens Aged 12 Days in Geer Oven at 70° C.

the green stocks were made after the samples had aged for 24 hours at 82° F. and 45% R.H. from the time of curing. Also test pieces were aged by the bomb and the Geer oven methods as well as by natural aging under constant temperature and relative humidity conditions. Two test pieces from each cure of each stock were run, and the average values taken as the final results. In these tests very close checks were obtained on samples from the same cure and stock. The variations which were noted fell within very narrow limitations.

Unaged Stocks

The results obtained on the green stocks with the four samples presented a wide variation in heat build up and actual time of blowout. The stock containing carbon black sample D offered the lowest heat build up and longest time to blowout; while the stock containing sample A, relatively the most finely subdivided carbon black, presented the greatest heat generating properties and shortest time to actual blowout. (See Table 3.) Samples B and C evidenced intermediate positions between samples A and D, sample C being better than sample B. The longer cure for each stock gave lower heat build up values and longer time to blowout than the shorter or 60-minute cures under the same testing conditions. The characteristics of the unaged stocks after blowout are shown in Figure 2.

Table 3

Sample	A	B	C	D
60 Min. at 30 Lbs.				
Initial dynamic compression	313	290	290	245
Temperature at blowout	310° F.	300° F.	285° F.	272° F.
Time to blowout	25' 10"	29' 57"	33' 15"	53' 6"
Final dynamic compression	504	490	492	416
Modulus changes during flexures	Softens	Softens	Softens	Softens
Permanent set	34.0%	31.8%	30.0%	24.2%
90 Min. at 30 Lbs.				
Initial dynamic compression	250	245	241	240
Temperature at blowout	295° F.	280° F.	273° F.	265° F.
Time to blowout	30' 33"	35' 10"	40' 16"	58' 24"
Final dynamic compression	477	437	450	460
Modulus changes during flexures	Softens	Softens	Softens	Softens
Permanent set	32.0%	28.5%	28.4%	26.8%

82° F. Aged Stocks

Test pieces were aged for 168 hours in the constant temperature room at 82° F. and 45% R.H. Slight differences in the results were noted for heat generation and blowout values than those obtained for the green stocks. A slightly wider difference was obtained in the permanent set results. These differences, however, were not too great and, if a sharp line of demarcation were not drawn, could be classified as fairly comparable with the results obtained on the green stocks. (See Table 4.)

Table 4

Sample	A	B	C	D
60 Min. at 30 Lbs.				
Initial dynamic compression	300	280	275	275
Temperature at blowout	305° F.	295° F.	280° F.	270° F.
Time to blowout	25' 55"	28' 21"	34' 53"	51' 40"
Final dynamic compression	520	495	475	502
Modulus changes during flexures	Softens	Softens	Softens	Softens
Permanent set	38.0%	34.0%	32.4%	27.3%
90 Min. at 30 Lbs.				
Initial dynamic compression	240	235	215	225
Temperature at blowout	287° F.	285° F.	277° F.	264° F.
Time to blowout	31' 10"	34' 23"	40' 15"	54' 30"
Final dynamic compression	473	460	425	422
Modulus changes during flexures	Softens	Softens	Softens	Softens
Permanent set	33.5%	30.2%	26.7%	22.0%

The characteristics of the stocks after blowout are shown in Figure 3.

70° C. Oven Aged Stocks

In the Geer oven aging test the specimens were aged for 12 days at 70° C. to determine the effect such aging would have on the heat build up in the stocks when subjected to flexing under compression loads. These aged stocks evidenced higher heat generating properties, with a

Table 5

Sample	A	B	C	D
60 Min. at 30 Lbs.				
Initial dynamic compression	185	190	180	185
Temperature at blowout	314° F.	300° F.	300° F.	291° F.
Time to blowout	21' 45"	26' 1"	29' 2"	42' 7"
Final dynamic compression	510	510	510	520
Modulus changes during flexures	Softens	Softens	Softens	Softens
Permanent set	34.0%	33.0%	32.0%	31.0%
90 Min. at 30 Lbs.				
Initial dynamic compression	175	165	160	180
Temperature at blowout	290° F.	292° F.	287° F.	272° F.
Time to blowout	23' 21"	29' 34"	30' 40"	41' 15"
Final dynamic compression	475	450	450	495
Modulus changes during flexures	Softens	Softens	Softens	Softens
Permanent set	27.4%	28.0%	29.0%	29.0%

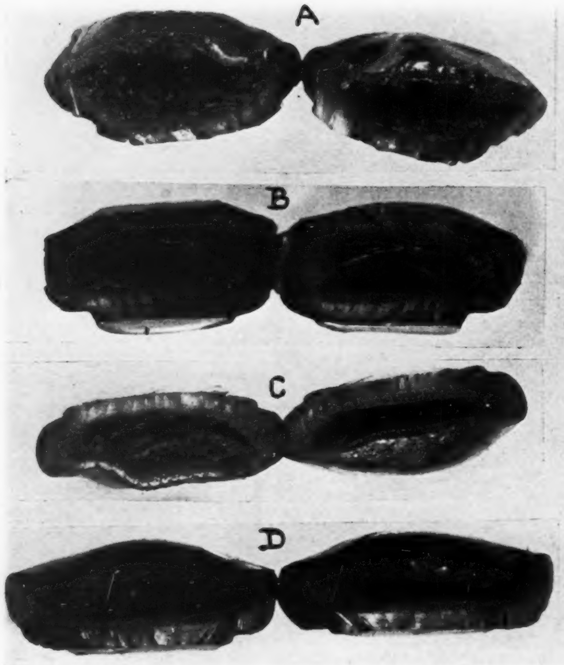


Fig. 5. Specimens Aged 24 Hours in Oxygen Bomb

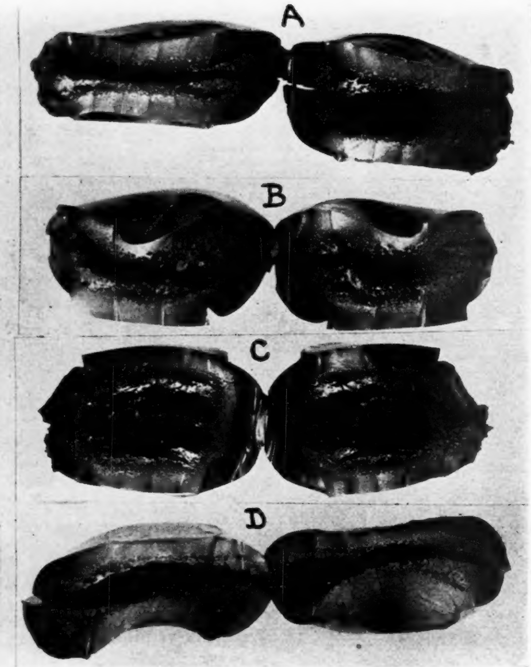


Fig. 6. Specimens Aged 72 Hours in Oxygen Bomb

consequent shortening of the cycle to actual blowout. (See Table 5.)

The characteristics of the stock after blowout are shown in Figure 4.

Bomb Aged Stocks

The heat build up values obtained on the one- and three-day oxygen bomb aging test were materially lowered. This, however, was to be expected, but the relation of one stock, as compared with the others, maintained their order as to the degree of heat generation. A fairly wide difference was obtained in the results of the one-day (Table 6) aging test as compared with the three-day test.

Table 6. One-Day Aging Test*

Sample	A	B	C	D
60 Min. at 30 Lbs.				
Initial dynamic compression....	275	245	275	250
Temperature at blowout........	238° F.	240° F.	235° F.	233° F.
Time to blowout...............	8′ 11″	10′ 4″	14′ 8″	18′ 7″
Final dynamic compression.....	575	575	580	585
Modulus changes during flexures.	Very soft	Very soft	Very soft	Very soft
Permanent set	...	...	...	...
90 Min. at 30 Lbs.				
Initial dynamic compression....	225	225	210	225
Temperature at blowout........	236° F.	242° F.	230° F.	239° F.
Time to blowout...............	10′ 0″	15′ 35″	19′ 30″	22′ 55″
Final dynamic compression.....	565	575	575	580
Modulus changes during flexures.	Very soft	Very soft	Very soft	Very soft
Permanent set	...	...	...	...

*Aged for 24 hours in a Bierer-Davis type of bomb at 300 lbs. pressure of oxygen/70° C.

Table 7. Three-Day Aging Test†

Sample	A	B	C	D
60 Min. at 30 Lbs.				
Initial dynamic compression....	300	273	275	280
Temperature at blowout........	192° F.	215° F.	220° F.	212° F.
Time to blowout...............	4′ 30″	6′ 14″	8′ 32″	9′ 20″
Final dynamic compression.....	585	575	575	583
Modulus changes during flexures.	Very soft	Very soft	Very soft	Very soft
Permanent set	...	...	...	...
90 Min. at 30 Lbs.				
Initial dynamic compression....	245	225	250	225
Temperature at blowout........	215° F.	235° F.	240° F.	232° F.
Time to blowout...............	6′ 8″	7′ 55″	8′ 45″	10′ 34″
Final dynamic compression.....	570	570	575	580
Modulus changes during flexures.	Very soft	Very soft	Very soft	Very soft
Permanent set	...	...	...	...

†Aged for 72 hours in a Bierer-Davis type of bomb at 300 lbs. pressure of oxygen/70° C.

(See Table 7.) The stocks in most instances were badly ruptured and presented a soft sticky structure. The stocks themselves after breakdown and blowout became badly distorted so that measurement for permanent set in most instances was impossible. (See Figure 5 for 24-hour specimens and Figure 6 for 72-hour specimens.) In the Geer oven and oxygen bomb aging tests the order as found between the short and long cures remained the same as was obtained for the green stock test.

Test Conclusions

These results indicate that different rubber grades of carbon black produced by the channel process exhibit different properties in relation to heat generation when incorporated in a rubber compound of the tread stock type. Within the scope of the rubber grades of carbon blacks certain grades can be classified as relatively low heat generating types. This heat generating characteristic cannot be definitely evaluated from other properties, such as rate of cure or from the stress-strain properties of a stock in which the carbon black may be incorporated. However relative particle size can be set up, more or less, as a criterion for indicating the effect the carbon black will have from the standpoint of heat build up as the results obtained indicate that the heat generating properties of carbon blacks are a function of their particle size. In the case of a relatively large particle-size carbon black an explanation might present itself in that the capillary spaces between the particles or agglomerate of particles are relatively large. Therefore during flexing, under a compressive load, less friction of the particles is obtained with consequent decrease in heat generation. On the other hand in the case of a carbon black possessing a much finer state of subdivision there are a greater number of specific surfaces present per given area which would result in smaller capillary spaces existing between the particles or agglomerate of particles. During flexing, under a compressive load, a greater friction would be obtained, thereby

increasing the heat generating properties of the stock.

In the green and aged abrasion tests the stock containing the relatively large particle-size carbon black, sample D, offered the least resistance to wear. If the results obtained in the abrasion test could be definitely correlated with actual resistance of a tire to road wear, then a certain percentage of non-skid mileage would be sacrificed if a relatively low heat generating type of channel black was compounded in the road contacting tread. However a small percentage of tread wear in certain types of tires might be sacrificed to minimize heat build up which, in many cases, results in blowout and tread separation.

The effect of relative particle size of carbon black on heat generation was progressive. The grades of carbon black having intermediate relative-size particles fall in line on the curve when temperature build up is plotted against time for actual blowout. The effect of aging evidenced material differences in heat generation per time cycle to blowout. However the relation between the samples as to heat generation and blowout remained unchanged.

Summary of Results

Carbon blacks manufactured by the channel process vary in their heat generating properties when incorporated in rubber compounds of the tread stock type. The heat generating property of a carbon black is a function of its particle size.

Definite evaluation of a carbon black of the channel type as to its heat generating properties cannot be determined from rate of cure or the stress properties of a stock in which it is compounded.

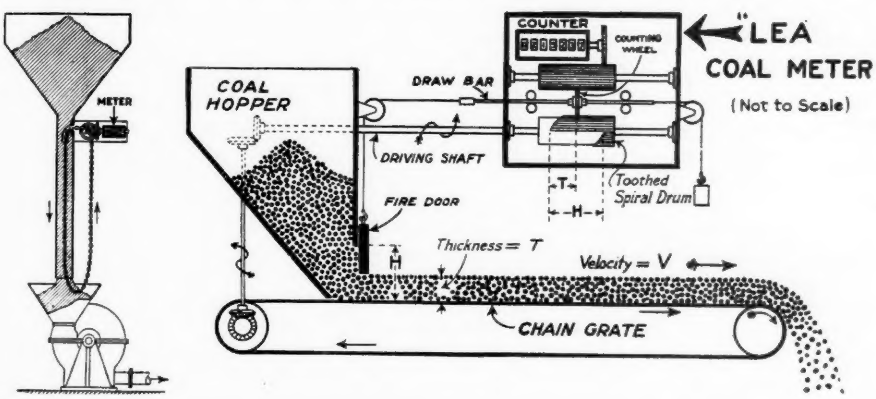
Rubber from Goldenrod

DR. E. C. AUCHTER, chief of the Bureau of Plant Industry, United States Department of Agriculture, recently told the Senate Appropriations Committee that by following up studies made by Thomas A. Edison the bureau had been able to increase the rubber content in goldenrod leaves to 8%. If a 12% content could be obtained, he stated, commercial production would be feasible when the world price of rubber was more than 20¢ a pound.

According to information received later from the Bureau of Plant Industry, extraction experiments on goldenrod have been made on only a small laboratory scale, and the investigation of its possible commercial uses has not been possible. Tests made by the National Bureau of Standards on very small samples indicated that the product obtained by its methods, that is, extraction by benzene, showed a tensile strength of about 1,500 pounds per square inch, or approximately 50% of comparable compounds of *Hevea* rubber, and approximately 35% of the resistance to abrasion of *Hevea* rubber in tire stocks. Some improvement has been possible in the grade of rubber extracted, and it is hoped that more comparable grades can be obtained after further experimental work. The main effort of this department has been to solve the biological questions in connection with the cultivation and selection of desirable plants from the yield standpoint.

Volumetric Measurement of Coal as Fired

Diagrams Illustrating Operating Principles for Volumetric Weighing of Coal



***Left,* Endless Chain Method. *Right,* Chain-Grate Stoker Method**

TO INSURE the desired B.T.U. input to boilers, volumetric measurements of coal fired eliminates the error due to variable moisture content which definitely changes the weight of coal in relation to its heat value, but does not materially affect the volume.

The accompanying diagrams illustrate two methods used for the volumetric measurement of coal. In one method, applicable to chain-grate stokers fed from hoppers and to coal pulverizers serving pulverized coal burners, a vertical endless loop of chain is installed so that one half of the loop is positioned within the coal chute and the other half outside. The chain, which is gripped and moved by the flowing coal, passes over a sprocket actuating a counting device. The volume of coal per unit of time is equal to the distance the coal or chain moves per unit of time multiplied by the cross-sectional area of the chute.

In the other method, which also applies to chain-grate stokers, a gate placed at the entrance to the grate and adjustable vertically is employed to fix the depth of the coal as it enters the combustion chamber. As the width is fixed, the cross-sectional area of the on-flowing coal is constant for any vertical adjustment of the gate. The rate of flow of the coal is measured by the speed of the chain grate through the use of appropriate sprockets and a counting device. The volume of coal per unit of time is calculated in the same manner as in the case of the vertical chute. Lea Recorder Co., Ltd.

Development of the Polish Rubber Industry

David Schrage [1]

BEFORE the war there were in the territory that is now Poland, only three small rubber factories which were chiefly devoted to serving the needs of local industry. During the war these factories were closed and suffered serious damage. The real development of the Polish rubber industry therefore covers not quite 20 years, and large-scale rubber industry is hardly 15 years old.

In the early years consumption remained on about the same level, and the problem was only one of replacing importation by domestic production. In 1922 imports were still 11 times as high as local output. But by 1926 local manufacture was able to cover about two-thirds of consumption. After 1926 a whirlwind rise in sales began, stimulating both production and imports. In 1927 sales were twice as high as in 1926, in 1928, four times as high, and in 1929, five times as high; a considerable part of the sales consisted of exports of all kinds of rubber footwear. Imports accounted for about 20% of total sales. Then came bad times and gradually the great economic crisis. Various newly and hardly won foreign markets were more and more shut off as a result of duties and import regulations; the domestic market was already saturated, and competition became severe. Selling possibilities were not much greater in 1931 and 1932 than in 1927, but at the same time productive capacity had expanded considerably.

From 1933 the capacity of the domestic market gradually improved; new lines were developed; total sales mounted again by leaps and bounds, reaching in 1934 the record totals of 1929, and continued to increase so that in 1938 they were almost twice as high as in the peak year 1929, and seven to eight times as high as in 1926. Imports fell to 7% of total sales.

Today the manufacture of rubber goods in Poland covers practically all the needs of the country, and such goods as are imported are either fancy goods subject to fashion or goods for special requirements, new and unforeseen, as automobile tires and tubes for imported cars, or to make up for deficiency, which since 1938 no longer exists, in Polish productive capacity (Poland at present has four automobile tire factories.)

The quality of the goods produced improves from year to year. Today Polish rubber footwear is obtainable in all the grades required in mass production goods. In recent years automobile tires are being manufactured under American licenses, and in one factory even under American supervision, and sold under American brands, both in the domestic and foreign markets. Polish rubber thread is now an article of export as are rubber sponges and so on; yes, even a certain amount of toys have recently been exported as a result of their quality. The Gordon Bennett balloon events have demonstrated that Polish rubberized fabrics for balloons are among the best in the world.

Each year brings an expansion in the production program. The advances of the last few years include, besides a series of smaller mechanical articles, the following: high pressure hose for hydraulic and pneumatic brakes, including oil-brakes; foam rubber from both rubber and latex, miscellaneous goods (especially toys) from latex, latex thread; protective rubber and ebonite coatings (from latex) on metals; and, quite recently, automobile tubes which may be considered nail- and bullet-proof.

The expansion of production brings with it shifts in the importance of individual articles, noticeable even over short periods of time. The output of all kinds of rubber footwear still tops the list. In 1935 footwear production was 2½ times as large as the production of tires and tubes for automobiles, motorcycles, and bicycles; in 1936 it was barely twice as large, and in 1938 only about 1½ times as great. For many years rubber heels and soles occupied second place; today they have moved pretty far down the list.

The latest production statistics cover the year 1937 and indicate an output of 4,900 tons of all kinds of rubber footwear in that year; 1,170 tons of cycle tires; 1,060 tons automobile, motorcycle, and airplane tires; 1,050 tons heels and soles; 705 tons rubber tubing, including automobile and cycle tubes; 620 tons rubber and asbestos goods; 340 tons rubber sheet; 190 tons rubber covers for rolls, etc.

At present there are in Poland over 60 undertakings which manufacture rubber either in special establishments or in a special section of the factory. These include two factories with a staff of from 1,000 to 2,000 persons, 11 factories with more than 400 employes, about 10 factories with more than 40 workers, around 25 factories employing over 20 persons. The rubber industry employs altogether approximately 10,000 persons (the above figures include the rubber section in the cable industry.)

In 1938 the imports of raw rubber came to 7,675 tons; of latex, 300 tons; reclaim, 216 tons; and factices, 29 tons. For a year now Poland has had its own reclaiming establishments; it produces good factices itself; in 1939 it started its own synthetic rubber factory where butadiene rubber is produced on an industrial scale from alcohol after a Polish process. Various inactive blacks are produced locally from naphthalene, natural gas, and turpentine residue. For the past year active gas also has been produced from naphthalene residues according to a Czech process. Two factories manufacture accelerators and antioxidants.

The total value of the Polish output of rubber goods in 1938 was probably over 80,000,000 zloty.

To present a better idea of the trend of the Polish rubber industry, figures are quoted from the balances of ten joint-stock companies. The machinery and technical equipment (not including the buildings) had a total book value of 13,775,000 zloty in 1935, and of 17,926,000 zloty in

(*Continued on page* 47)

[1] President of the Gentleman Rubber Co., Lodz, Poland.

Bitumen-Rubber Mixtures in Road Construction

George W. Eckert[1]

INVESTIGATIONS of bitumen-rubber mixtures have been concerned with their preparation, physical properties, and applications. The purpose of this review is to summarize published information on bitumen and rubber mixtures containing less rubber than bitumen, which have been studied for their value in road construction. The subject matter is classified according to five phases of logical consideration: methods of preparation; physical properties; addition agents; preparation of bitumen-rubber-aggregate systems; and application to road construction.

Mixtures of rubber and bitumen containing more rubber than bitumen are largely restricted to industries concerned with the manufacture of rubber products. These types of mixtures are too expensive for any extended use in road construction although they do have a limited application in joint fillers and paving blocks. Van Heurn,[2] Becker,[3] Dannerth,[4] Adel,[5] Weber,[6] and North[7] have presented reviews on the use of bitumen in the rubber industry, and it is fitting here to make only a few remarks concerning this phase of rubbei and bitumen mixtures. Asphaltic bitumens are used in the rubber industry: to cheapen the cost of rubber mixtures; to act as softeners or plasticizers; and to increase resistance to the action of water and air. The requirements of bitumen when added to rubber are: it must not reduce the elasticity of the vulcanized rubber compound; it must disperse in the rubber without becoming granular; it must be free from material volatile at the vulcanization temperature; and it must be of such consistency that it can be worked on the rolls at the working temperature.

Preparation of Bitumen-Rubber Mixtures

There are several possible ways by which rubber can be incorporated into bitumens, each of which shall be discussed separately. The majority of the methods can be classified into three types of mixing procedures: mechanical mixing, with or without heating; use of a solvent medium; and emulsification.

Some work reported in the literature and patents relate to the mixing of rubber with asphalts at ordinary temperature conditions, but most mixing processes are accomplished at elevated temperatures. Binmore[8] incorporated vulcanized waste rubber with asphalt on a mixing mill until uniformly distributed, and Kirschbraun[9] intimately mixed rubber with bitumen prior to emulsifying them. Davey[10] found that raw rubber even in crumb form was difficult to dissolve in bitumen, but that at temperatures exceeding 170° C. homogeneous solutions of disintegrated crepe and other types of crumb could be prepared with asphalts. Compositions containing India rubber, etc. and tar have been produced by heating these materials together,[11] and gas-tar and rubber materials have been mixed satisfactorily in a container maintained at a temperature close to the boiling point of the tar.[12] A process has been claimed[13] in which raw rubber or ground vulcanized scrap rubber is added and mixed with bituminous material heated to a suitable consistency. Another method is specified which consists of agitating mineral matter, vulcanized rubber, and bituminous material at temperatures sufficiently high to soften the rubber.[14] One bitumen-rubber composition is prepared by adding a mixture of rubber and metallic oxides to molten asphalts or tars.[15] The preparation of compositions by dispersing rubber in melted bitumens are also described in patents by D'Aloe,[16] Claxton,[12] Hewitt,[17] and Campbell.[18]

A solvent medium can be used to mix intimately small amounts of rubber with bitumens, after which the solvent may or may not be removed prior to using the mixture. In one example of this method rubber is dissolved in tetrachlorethane and benzene, then mixed with bitumen, using one part to 1.5 parts of rubber to 100 parts of bitumen.[19] The rubber may also be treated with a solvent "without the aid of tetrachlorethane"[20] after which it is mixed with bitumen. In another procedure rubber in solution in benzene, naphtha, or other solvent is added to melted petroleum bitumen.[21] Pratt and Handley[22, 23] have shown that rubber can be incorporated into a pitch by use of a volatile tar oil (preferably a low-temperature tar oil) which dissolves both rubber and pitch and can later be removed by steam distillation. Broome[24] indicated that rubber can be conveniently incorporated with asphalt by dissolving the rubber-oil flux. A French patent[25] covers a method of making bitumen-rubber mixtures by suspending finely divided rubber in a liquid (which does not dissolve the rubber, but which is completely miscible with the asphalt) and mixing the rubber-liquid dispersion with the molten asphalt. Wyss[26] has described a process

[1] Research chemist, Missouri State Highway Department, University of Missouri, Columbia, Mo.

[2] "The Use of Bitumen as Mineral Rubber in the Rubber Industry." *Bitumen*, 5, 121 (1935).

[3] "Bitumen as Mineral Rubber in Rubber Technology." *Kautschuk*, 12, 131 (1936).

[4] "Pitch Hydrocarbons Used in Rubber Industry." INDIA RUBBER WORLD, Aug. 1, 1921, p. 821.

[5] "Use of Asphaltic Bitumen in the Rubber Industry." *Bitumen*, 2, 50 (1932).

[6] "Chemistry of India Rubber," 1st Ed., 1902; 4th Ed., 1926, p. 214.

[7] "The Use of Bitumen in Rubber." INDIA RUBBER WORLD, Dec. 1, 1921, p. 191.

[8] Canadian patent No. 276,640 (1927).

[9] British patent No. 315,839 (1928).

[10] "The Physical Properties of Rubber-Bitumen Mixtures." *J. Soc. Chem. Ind.*, 55, 43T (1936).

[11] British patent No. 200,819 (1923).

[12] British patent No. 201,006 (1922).

[13] U. S. patent No. 1,742,651.

[14] British patent No. 246,548.

[15] British patent No. 307,466 (1929).

[16] British patent No. 11,949 (1908).

[17] British patent No. 319,904 (1928).

[18] British patent No. 263,028 (1926).

[19] British patent No. 198,136 (1922).

[20] British patent No. 216,602 (1923).

[21] British patent No. 358,142 (1929).

[22] "Incorporation of Rubber Derivatives with Tar Products." Rubber Growers' Assoc., Sept., 1936.

[23] "Incorporation of Rubber with Tar Products." *India Rubber J.*, Aug. 17, 1935, p. 10; *Bull. Rubber Growers' Assoc.*, 17, 245 (1935); *Gas. J. (London)*, 211, 583 (1935).

[24] "Rubber and Asphalt Mixtures for Road Construction." INDIA RUBBER WORLD, Dec. 1, 1937, p. 37.

[25] No. 783,041, July 6, 1935.

[26] Swiss patent No. 180,967, Feb. 17, 1936.

in which tar and waste rubber are mixed and dissolved in the least amount of solvent at a high temperature. Solutions of rubber in carbon disulphide, benzene, solvent naphtha, kerosene, etc., for admixing rubber with bitumen have been suggested in the patents of de Caudemberg,[27] Meadows,[20] Winkler,[15] Armstrong,[28] Sadtler,[29] and Agthe.[21] Krishna[30] used castor oil as a dispersion medium for the preparation of adhesive compositions.

The preparation of mixtures of bitumen and rubber has been accomplished with varying degrees of success by emulsification. Barron[31] has pointed out that such colloidal systems as bitumen-rubber emulsions require careful supervision because of their uncertain behavior. Davey[10] obtained homogeneous mixtures of bitumen and rubber by mixing ammonia preserved 40% latex with warm bitumen and then evaporating the water. He indicated, however, that the removal of water would be troublesome on a large scale. Pratt and Handley[23] have suggested that rubber can be readily introduced into tar by direct mixing of latex and the tar, after which the water is removed. Svensson[32] patented a process for preparing bitumen-rubber mixtures by mixing separate emulsions of rubber and bitumen. Gabriel and Blott[33] prepared mixtures by dispersing molten bitumen and rubber latex by means of a colloid mill. In another process a solution or aqueous suspension of rubber is added to a bituminous material undergoing emulsification.[34] Rubber, reclaim, balata, gutta percha, etc. can be mixed with asphalt or tar by emulsification at 80 to 84° C., using colloidal clay as a dispersing agent.[9] Another patented process[35] involves mixing molten bitumen and rubber latex in a colloid mill without the addition of dispersing agents. A bitumen-rubber emulsion can also be prepared by adding a natural rubber-latex stabilized with ammonia to an emulsion of bituminous material dispersed by means of clay.[36] An aqueous keratinous hydrosol can be used as a dispersing agent for preparing emulsions of bitumen and rubber.[37] Moser[38] added a latex gel to asphalt dispersions. The gel was prepared by adding aluminum chloride to a latex containing ammonia with the consequent formation of aluminum hydroxide. In a similar patent[39] aluminum chloride or zinc chloride is added to a bitumen-rubber dispersion containing potassium hydroxide.

Physical Properties of These Mixtures

Fol and Plaizier[40] have reported that raw rubber added to asphaltic bitumen increases the elasticity, resistance to cracking, and adhesion to stone. They also indicated that rubber powder or crumb added to bitumen raises the softening point and resistance to penetration, improves the impact resistance and resistance to indentation, and reduces the tendency to flow. They also stated that a bituminous binder prepared from an emulsion of bitumen to which latex has been added has a higher resistance to penetration, is more elastic, and has more adhesiveness for stone than bitumen to which latex has not been added. Davey[10] has studied the properties of bitumen containing small quantities of rubber by means of twisting and elasticity, softening point, penetration, and ductility tests. He found that the addition of nine parts of rubber or less to 100 parts of bitumen without overheating increases the elasticity. The properties of rubber-bitumen mixtures prepared by application of heat vary with the temperature and time of heating. If the mixtures are overheated, the rubber is decomposed along with detrimental effects on the asphalt. Broome[24] has shown that as low as 1, 2, and 3% rubber added to bitumen raises the softening point of the latter and decreases the penetration without reducing the ductility. Brown[41] has claimed that substances such as gutta-percha pitch, balata pitch, or low-grade rubber-like substances added to bituminous compositions improve the adherence of the latter to concrete and other road surfaces. He also maintained that the product will not harden, polish, become slippery, or change under the influence of climate or traffic. It has been suggested that only small quantities of rubber latex are required to improve the wetting power of tars for road-making.[42] Sadtler[43] has pointed out that the presence of a relatively small quantity of rubber improves the properties of bituminous materials and facilitates the manipulative process by increasing the penetration, ductility, and plasticity. Also the rubber substantially increases the water resistance, cohesion, adhesion, and toughness of the binder in the finished pavement. Van Haagen[44] has stated that rubber improves the adhesion of asphalt to road aggregate and also that it improves the durability of asphalt for road surfaces. Cowling[45] has indicated that the disadvantage of using latex-bitumen emulsions in road surfacing is the lack of adhesive power, which leads to necessity of keying. Uno and Ishida[46] have prepared a composition having a small susceptibility ratio by dissolving rubber in oil and then compounding 1 to 3% of the rubber solution with an asphalt. The properties of bitumen-rubber compositions can be improved by blowing with air to oxidize partially the material.[47, 48] Van Rooijen[49] has suggested that the improvement of asphaltic bitumens by the addition of rubber is due to the selective adsorption of lighter hydrocarbons. The properties of rubber-tar and rubber-chlorinated tar, and the flow properties of bitumens with varying amounts of rubber are being investigated by the British Rubber Research Board.[50] They are also studying the use of crumb rubber and latex rubber with bitumen for surfacing and are testing the adhesion, resilience, and abrasion properties of rubber-bitumen road surfacing materials.

Addition Agents

A variety of types of materials have been proposed and used as addition agents for bitumen-rubber mixtures to counteract or improve certain properties. Among the many substances which have been mentioned are: alkalies,[51] protective colloids,[51] products obtained in the destructive distillation of animal substances,[42] oxidizing agents,[48] waxes and fats,[48] sodium chloride,[51] natural and synthetic resins,[17, 52] chlorinated hydrocarbons,[53] and

[27] British patent No. 27,128 (1913).
[28] British patent No. 312,372 (1927).
[29] British patent No. 357,603 (1930).
[30] British patent No. 382,557 (1932).
[31] "Rubber, Bitumen and Road Surfaces." *India Rubber J.*, Oct. 31, 1935, pp. 23-31.
[32] British patent No. 384,138 (1932).
[33] U. S. patent No. 1,886,334, Nov. 1, 1932.
[34] British patent No. 254,004 (1926).
[35] British patent No. 329,965 (1929).
[36] U. S. patent No. 1,831,226, Nov. 10, 1931.
[37] U. S. patent No. 2,109,663, Mar. 1, 1938.
[38] British patent No. 278,395.
[39] Dutch patent No. 25,202 (1931).
[40] "Influence of the Addition of Rubber on the Properties of Bitumen." *Wegen,* 13, 201 (1937), *Brit. Chem. Abstr.,* Apr., 1938, p. 341; "Influence of Addition of Rubber on Properties of Asphaltic Bitumen." *Wegen,* Apr. 1, 1937; "Effect of Addition of Rubber on the Properties of Asphaltic Bitumen." *Med. Rubber-Sticht,* Sept., 1937, p. 3, *Chemie & industrie,* 1129 (1938).
[41] British patent No. 246,065 (1925).
[42] British patent No. 355,937 (1930).
[43] U. S. patent No. 1,758,915 (1930); British patent No. 359,924.
[44] British patent No. 231,503.
[45] "Rubber Roadways." *Munic. Eng. Sanit. Rec.,* 95, 541 (1935).
[46] "An Asphalt Compound." *J. Soc. Chem. Ind. Japan,* 39, 90 (1936).
[47] British patent No. 464,562, Apr. 20, 1937.
[48] Austrian patent No. 150,006, June 25, 1937.
[49] "Influence of Rubber on Asphalt Bitumen." *Tech.-Ind. Schweiz. Chem. Ztg.,* 21, 199 (1938); *Chem. Abs.,* 32, 9471, 1938.
[50] "Roads and Road Construction," p. 153, Rubber Growers' Assoc., May, 1938.
[51] British patent No. 460,854, Feb. 1, 1937.
[52] "Digest of Patents on the Use of Bitumen-Rubber Mixtures in Road Construction," *Bull. Rubber Growers' Assoc.,* Aug., 1938, pp. 339-42; German patent No. 655,288, Jan. 12, 1938.
[53] British patent No. 363,698 (1931).

natural or synthetic gums.[54] A number of patents dealing with bitumen-rubber compositions for use in road construction include the addition of sulphur for vulcanization.[20, 28, 48, 55] A patented bitumen-rubber composition consists of rubber 100 parts, sulphur 36 parts, and heavy tar oil 27 parts.[16] Tar materials to which small amounts of latex or rubber solutions have been added may also be vulcanized. Davey[10] has investigated the effect of adding sulphur to mixtures of bitumen and rubber and obtained products having high elastic properties with high softening point as compared with the original bitumen. He obtained the best results with mixtures having equal amounts of sulphur and rubber. In the application of bitumen-rubber mixtures fillers of nearly all types have been used. Fillers which have been specified in various patents include sand, limestone, asbestos powder, sawdust, iron slag, cement, lime, plaster of Paris, clay, magnesia, carbon black, zinc oxide, and pulverized coal.

It is well to mention here that investigations of bitumen-rubber mixtures for application in surfacing roads have involved practically all types of rubber materials. Such products which have been used besides rubber in latex and crumb form are "Nitrite" rubber,[56] chlorinated rubber,[57] waste rubber, [54, 58] balata pitch,[59] gutta percha,[60] and synthetic rubber.[61]

Bitumen-Rubber-Aggregate Systems

Mixtures of bitumen and rubber binder with aggregate may be prepared in a number of ways. Rubber can be added to a bitumen-aggregate mixture,[62] or the constituents, rubber, bitumen, and aggregate can be mixed at a temperature which will melt the bitumen, but not the rubber.[63] This latter method is used in a type of surfacing called the "Dussek Rubber Road." Dussek[64] experimented with various types of rubber and bitumen mixes and eventually devised a mixture which he claimed would give a low cost non-skid surface. A composition patented by Dussek[65] consists of aggregate 70-85, bitumen 9-15, and waste shredded vulcanized rubber 5-15% by volume. Ross[66] coated granite chippings with tar; then mixed the coated aggregate with hard rubber chippings.

Sadtler[29] described in a patent several procedures for mixing rubber and asphalt with aggregate, in which a liquefier, rubber, and asphalt can be added to an aggregate in the following ways: first adding the liquefier, then rubber or latex, finally the asphalt; adding the latex, the liquefier, then the asphalt; or adding the latex, emulsified liquefier, then asphalt. The liquefier may be gasoline, kerosene, or the like; the rubber may be raw rubber, as latex or as a solution in a hydrocarbon oil; and the rubber used may vary from 0.2 to 2.0% of the bitumen.

Use of Bitumen-Rubber Mixtures in Road Construction

The first patent concerned with the application of bitumen-rubber mixtures to road surfacing, according to Barron[31] was obtained by Cassell[67] in 1844. Since that time various types of compositions have been devised for the preparation of joint fillers, paving blocks, road surfacings and dressings, and binders. A road surfacing composition was devised by Svensson[68] consisting of an asphalt-rubber emulsion with a thickening agent such as bentonite. D'Antal[69] impregnated mats of coarse vegetable fiber with mixtures of latex and bituminous substances for use as a road surfacing material. A composition developed for use as an expansion joint for concrete consists of bituminous material containing 5 to 10% rubber to which has been added some fibrous material.[13] Bitumen rubber compositions useful for joint fillers have been reported by Stanton,[70] Fischer,[71] and others. De Caudemberg[27] used a rubber-tar mixture (prepared by adding a solution of raw rubber in benzene-carbon disulphide to a tar residue) for making blocks for paving purposes. Paving blocks have been prepared from bituminous material containing rubber and a filler.[72]

A number of state, provincial, and test roads using rubber-asphalt mixtures have been built in Holland,[73] and test roads using bituminous emulsions containing latex have been constructed in Kuala Lumpur by the Rubber Research Institute of Malaya.[74] Experimental roads employing bituminous materials containing up to 10% rubber have been laid in Colombo and in Java.[75] Broome[24] has reported that experimental stretches of roads have been constructed in London and in the South of England and are nearly all giving good service under practical conditions. Experimental roads have also been laid in Netherland India,[76] where it has been found that tests over long periods of time are necessary to reach a fair conclusion as to the merits of bitumen-rubber mixtures in road construction. The results of the various experiments conducted with test roads as reported in the literature indicate that good road surfaces can be built using bitumen-rubber mixtures; however the success depends upon the type of mixture used as well as upon the many other factors which are effective in all bituminous roads.

[54] British patent No. 366,559.
[55] British patent No. 460,962, Feb. 1, 1937; British patent No. 216,245 (1923).
[56] British patent No. 428,100, May 7, 1935.
[57] French patent No. 754.119, Nov. 2, 1933; British patent No. 411 640, June 14, 1934; French patent No. 778,635, Mar. 21, 1935; German patent No. 614,037, May 31, 1935.
[58] British patent No. 342,320 (1929).
[59] British patent No. 267,317 (1925).
[60] British patents No. 10,185 (1843), 11.575 (1847).
[61] "Mixtures of Asphalt and Synthetic Rubber." D. Pospkhov and A. Fokin, *Mem. Inst. Chem. All.-Uk. Acad. Sci.*, 1, 287 (1935).
[62] British patent No. 460,526, Jan. 29, 1937.
[63] "A Practical Rubber Road." *Highways and Bridges*, Dec. 8, 1937, p. 3; *Highway Research Abstracts*, Jan., 1938, p. 1.
[64] "Rubber Road Construction." *Can. Engr.*, Aug. 16, 1938, p. 10.
[65] French patent No. 811,750, Apr. 21, 1937.
[66] British patent No. 330,399.
[67] British patent No. 10,327.
[68] British patent No. 384.138 (1932).
[69] British patent No. 399.684 (1933).
[70] "Find Improved Joint Filler." *Concrete*, Nov., 1936, p. 11.
[71] U. S. patent No. 1.742.265, Jan. 7, 1930.
[72] British patent No. 247,238 (1925).
[73] "Rubber Asphalt Roads in Holland." *Roads and Road Construction*, June, 1938, p. 184.
[74] "Latex Road Surfacing." INDIA RUBBER WORLD, Aug., 1932, p. 59.
[75] "Rubber Roadway: History and Development." J. D. Hastings, *Rubber Age (N. Y.)*, Oct. 10, 1932, p. 15.
[76] "Rubber for Roadway Construction." T. Hoedt, G. van der Bie, C. Ortt, and R. Kerkhoven, *Arch. Rubbercultuur*, 22, 23 (1938); *Chem. Abs.*, 32, 9556 (1938).

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Rubber Thread

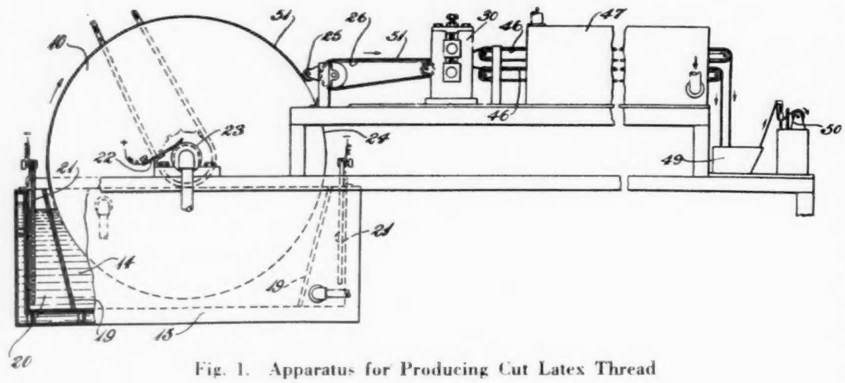

Fig. 1. Apparatus for Producing Cut Latex Thread

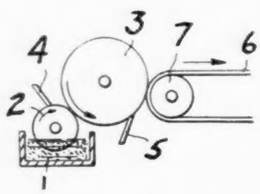

Fig. 2. Roll-Type Apparatus

ACCORDING to Bureau of Census figures, 5,618,105 pounds of rubber thread valued at $3,475,477 were produced in this country during 1937. The following group of patents relating to the manufacture of rubber thread deals with some of the more recent developments in this field. Three of the patents indicate disadvantages of smooth-surfaced round thread and suggest remedies which are said to improve the characteristics of thread when woven or covered. One patent proposes the production of thread by deposition upon a traveling wire; while another provides for reduction of thread entanglement during production and subsequent handling. Still another discloses a constant tension device for reducing elongation variation in covered thread.

Cut Latex Thread [1]

The object of this patent is to provide for the manufacture of a rubber thread, substantially round, but with slight surface irregularities to increase frictional resistance of the thread without detracting from its resistance to chafing.

The apparatus, as illustrated in Figure 1, comprises a hollow rotatable drum 10 provided with cooling water connections. The drum dips into latex 14 contained in a metal tank 15 provided with a water jacket for cooling. Porous diaphragms 19 made of unglazed porcelain or similar material are inserted in the tank near the drum surface to separate the latex from a cathode liquid 20 which may be tap water or a solution of a neutral conductive salt. Metal cathodes 21 are inserted in both ends of the tank and connected to the negative terminal of a direct current source. The positive terminal is connected to a brush 22 which contacts with a slip ring 23 mounted on the drum shaft. The ends of the deposition drum are coated with an insulating paint or varnish, or a thin layer of rubber; while the peripheral surface 24 is made of zinc, cadmium, or similar metal. A stripping roller 25 removes a sheet of deposited rubber from the drum 10 and delivers it to a belt conveyer 26 arranged to convey the sheet to a multiple disk rotary shear 30. Beyond is a pair of endless belt conveyers 46 arranged to receive cut strips of rubber coagulum from the shearing device and convey them through a drier or vulcanizer 47. At the delivery end are boxes 49 into which the threads may fall before being wound upon bobbins 50.

In operation rubber is electrically deposited on the drum to form a continuous sheet 51 of water-containing coagulum. The plastic and deformable, but somewhat resilient and quite cohesive sheet of coagulum is then directed into the bight of the disk shears, and as it progresses toward the common axial plane of the disks, they apply a progressively increasing pressure to opposite faces of the sheet along longitudinally parallel lines. The overlapping upper and lower shear disks provide a pinching and cutting operation on the plastic coagulum so that threads of substantially round cross-section are formed which exhibit two diametrically opposed longitudinal seams. The seams in most cases occur as continuous or discontinuous slightly projecting ribs, but in some instances the seams open slightly to produce concave depressions. The machine produces round threads when shearing a sheet of coagulum substantially equal in thickness to the width of the shear disks. It may be employed also for making strips or bands of rubber, and in this case the disks of the rotary shear are considerably wider than the thickness of the sheet.

Vari-Shaped Threads [2]

An apparatus forms rubber threads of various cross-sectional shapes. The purpose of varying the shape is to increase the grip of cover windings. Referring to Figure 2, a rubber solution or latex is fed from a tank 1 by means of roll 2 to a grooved roll 3. The deposition of latex is controlled by doctor blade 4 on roll 2 and also by a doctor blade 5 on roll 3 which removes the excess between grooves and shapes the upper surface of the threads formed. The rotating roll 3 is adjacent to an endless belt 6 passing over roll 7; the belt is designed to remove the threads from the roll 3 and carry them forward for coagulating and drying. The full cross-section of the thread is determined partly by the shape and the size of the roller grooves and partly by complementary recesses in the doctor blade. The shape of the grooves and recesses may be varied, depending upon the shape of thread desired.

Threads with Surface Projections [3]

Rubber threads adapted to covering with a textile ma-

[1] U. S. patent No. 2,061,749, Nov. 24, 1936.
[2] U. S. patent No. 2,125,034, July 26, 1938.
[3] U. S. patent No. 2,152,826, Apr. 4, 1939.

terial are provided with one or more compressible projections on their surface for the following purposes: to prevent creeping and displacement of the covering; to provide a covered thread in which the body of the rubber filament is substantially not indented even though the covering is kept in a taut condition; and to provide an uncovered rubber thread which will not become displaced in the fabric when knitted with textile threads.

As shown in Figure 3, the rubber filament is composed essentially of two elements, a body portion 1 and one or more relatively small projecting fins 2 attached to the body portion. The cross-section of the body portion 1 may be generally circular, square, triangular, elliptical, etc. in shape. The size, shape, number, and positioning of the fins are such that they are readily compressible against the body portion under a winding pressure normally suitable for applying the covering.

The filaments may be formed by extruding or casting latex, rubber or rubber-containing fluids, or by collecting latex, etc., upon a suitable heated member. Thus the filaments may be made by extrusion through a suitable orifice, using a latex composition which has been thickened by such agents as sodium silicate. The thickened extruded mass retains the cross-section of the orifice until coagulation occurs.

The irregular cross-section results in a larger covered thread than would be produced by the use of a round core containing the same volume of rubber and hence produces a lighter fabric for equal thickness of thread in identical weaves. Also, the air spaces provided between the core body and the covering increase the insulating capacity of the covered thread.

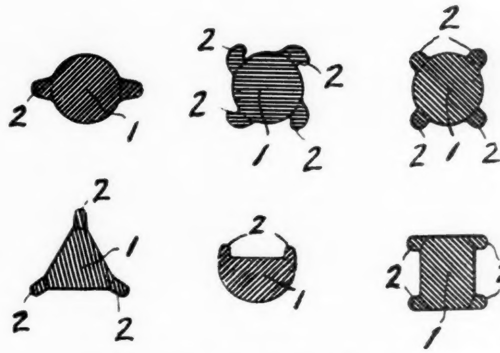

Fig. 3. Thread with Surface Projections

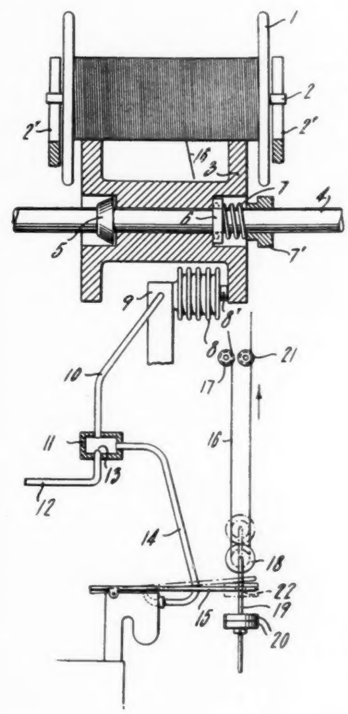

Fig. 4. Constant Tension Device

Constant Tension Control[4]

A control apparatus for feeding rubber thread to a covering machine imparts constant tension to the traveling elastic filament, thus providing for a greatly increased uniformity of elongation of the covered thread and, consequently, a reduction in the variation of fabrics using the thread.

In Figure 4 the numeral 1 designates a spool of rubber thread, the spindle 2 of which is mounted in slotted guides 2' so that the spool may rest by gravity on the flanged drum 3 rotatably and slidably mounted on the drive shaft 4. The shaft is clutched in driving relation to the drum 3 (a) by means of the ball thrust bearing 6 which is slidable on the shaft 4 and is forced against one end of the hub by the spring 7; and (b) by the clutch collar 5 which is fixed on the shaft and frictionally engages the other end of the hub. Spring 7 is retained on the shaft by collar 7' fixed to the shaft. A brake operated by fluid pressure controlled bellows retards the speed of the drum relative to the shaft. The bellows 8, mounted on a support 9, has a friction member 8' at its free end to engage the drum flange. It is seen that, by controlling the fluid pressure in the bellows, the braking action on the drum flange and also the degree of slippage between the drum hub and collar 5 may be controlled so that the drum will rotate at any required intermediate speed. By reason of the gravity support of the spool 1 on the drum 3 the rubber thread will be unreeled from the spool at the peripheral speed of the drum 3, regardless of the amount of thread on the spool.

Communicating with the bellows 8 through a pipe 10 is a pressure control chamber 11, to which air or other fluid is supplied under constant pressure by supply pipe 12 and its nozzle 13. Leading from the chamber is an air-leak pipe 14, the reduced end of which may be partially or completely closed by the pivoted valve lever 15, thus providing control of the pressure in chamber 11 and hence of the pressure in the bellows.

The rubber thread 16 is led around a fixed guide pulley 17 and then around floating pulley 18 which by means of a rod 19 carries the weights 20. After passing around the floating pulley 18, the thread passes around the fixed guide pulley 21 and thence to the covering apparatus or a wind-up spool. The rod 19 attached to the pulley 18 passes through an opening 22 in the pivoted valve lever 15.

By varying the number of weights 20 the desired amount of tension may be placed upon the thread, and by reason of the floating character of the pulley 18 this tension will be constant regardless of the length of the thread loop. If there is any change in the thread elongation as it comes from the spool, the pulley 18 will rise or fall. Upon any decrease in elongation sufficient to lift the weights 20 into contact with the pivoted valve lever 15, the air-leak valve at the end of pipe 14 will be partially opened and thus reduce the braking action on the drum and permit a greater driving torque to be transmitted to the drum. The resulting increase in speed in the delivery of thread from the spool thus compensates for the decrease in elongation. Upon an increase in the length of the suspended thread, the reverse of the above occurs with a resulting decrease in the rate of delivery.

In normal operation the air-leak valve remains in a partly closed position which varies slightly according to variations in the elongation of the thread, thus effecting a continuous throttling control on the brake and clutch. The mechanism is instantly responsive to slight variations in

[4] U. S. patent No. 2,098,422, Nov. 9, 1937.

the elongation of the thread, maintaining the length of the suspended loop substantially constant. The smoothness with which the throttling action operates may be increased by increasing the leverage ratio of lever 15.

Traveling Wire Process[5]

A simple and rapid process for the manufacture of rubber thread comprises essentially the deposition of latex on to a traveling wire having at least one comparatively sharp longitudinal edge and stripping the rubber deposit from the wire surface in thread form. If a wire with only a single sharp edge is used, a thread which will be hollow and slit longitudinally will be formed. If a flat ribbon-like wire is used, two threads, one from each face of the ribbon, will be formed. A triangular wire will produce three threads, one from each flat face, and similarly an increase in the number of sharp edges above three will produce a corresponding increase in the number of threads. The threads formed on a flat face will be lens shaped or plano-convex in cross-section. It is preferred to use concentrated latex containing a low-temperature accelerator so that the rubber may become vulcanized during the drying operation prior to stripping from the wire. Vulcanized latex also may be used if desired.

Referring to Figure 5, an endless triangular wire 10 travels under a motor-driven drum 11 and over a second drum 13, parallel to and above drum 11. The drums have a series of parallel circumferential grooves shaped to fit the traveling wire which is fed from one groove of the bottom drum to the corresponding groove of the top drum, etc. across the width of the drums. With the help of pulleys 14 and 15 the wire is fed back to the starting groove again. The lower surface of drum 11 is immersed in a tank of coagulant 16 so that the wire may be wet with coagulant before passing vertically through the latex in tank 18. A wiper in the orifice at the bottom of this tank wipes off the excess coagulant and also serves to prevent the leakage of latex through the orifice. After the wire leaves the latex tank, it passes through a vertical drying chamber, entering at 21 and leaving at 22. Hot air for the drying enters at 23 and leaves at 24. The wire with the dried or vulcanized deposit passes through a talc applying device 25. The rubber deposit is removed from each face of the wire in the form of a thread by take-off rolls 26, 27, and 28 which are rotated by a small motor assembly 29. The thread T as stripped from the traveling wire is fed to containers 30.

There are as many passes of wire as there are grooves in the surface of the drums, and if one deposit of latex gives a rubber film of sufficient thickness, the take-off rolls may pull off threads from each pass of the endless wire. If heavier gages are desired, the threads may be stripped from intermittent passes of wire, thus permitting multiple dips.

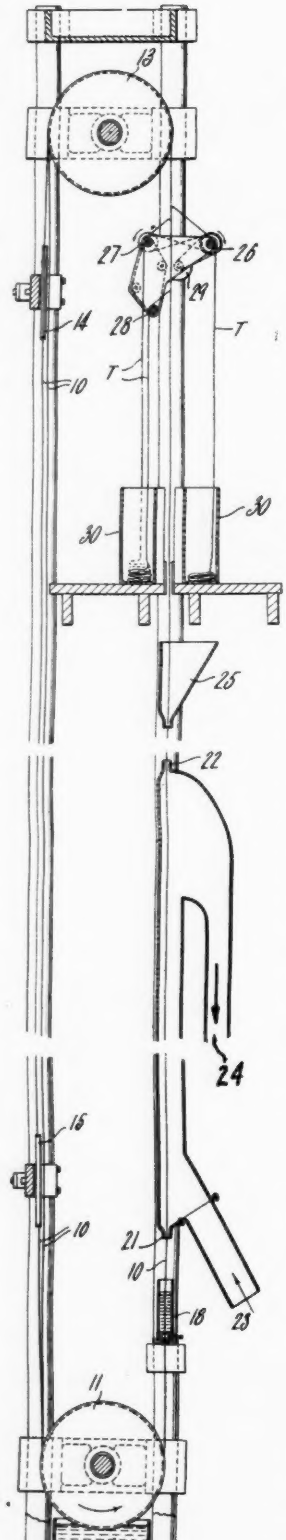

Fig. 5. Wire-Type Apparatus

Tape of Parallel Threads[6]

The common practice in making rubber thread from calendered rubber consists of winding a sheet of rubber on a large drum and then cutting simultaneously through all of the plies by means of a rotary disk cutter, which moves across the face of the drum at a fixed rate simultaneously with the rotation of the drum. A serious objection to this method is that no practical way has been devised heretofore for guiding the individual threads away from the cutting point without having them become entangled with adjacent threads. Also it is impossible to produce thread by this method of the long lengths often desired in weaving, braiding, and similar operations. The present invention aims at a solution of these and other problems.

The preferred method of manufacture comprises: assembling a series of circular sheets of rubber in superposed relation; adhesively securing these sheets temporarily to each other; and then revolving this assembly edgewise against the sharpened edge of a rapidly revolving knife so as to cut a continuous tape from the stack of sheets. This tape is composed of rubber threads lying parallel to each other and adhesively joined; the nature of the union between adjoining threads is such that while it maintains the tape-like form of the structure during normal handling, it can readily be broken to separate the individual threads. The tape is taken away from the cutting point continuously, is wound on a suitable support, and is divided into its component threads at any time appropriate to the requirements of individual uses.

It is usually preferred to vulcanize the sheets prior to cutting. The controlled adhesion is obtained usually before vulcanization by dusting the sheets lightly with talc, most of which is rubbed off so that the plies will be joined lightly to each other. Also threads may be maintained in an assembled condition when made from latex.

To Remove Rust from Metals

To remove rust from metals Dr. C. F. Mason, in *Chemical Industries* recommends the following glycerine-containing preparation, a paste particularly suited for use in inaccessible engraved surfaces:

Oxalic acid	20
Phosphoric acid	20
Glycerine	10
Ground silica	50

The paste is applied to the rusted area, allowed to stand in a warm place 15 to 20 minutes, and is then washed off.

[5] U.S. patent No. 2,107,032, Feb. 1, 1938.
[6] U.S. patent No. 2,082,744, June 1, 1937.

A New Oscillograph for Routine Tests of Rubber and Rubber-like Materials[1]

Felix L. Yerzley[2]

THE use of rubber and similar substances for vibration and shock isolation has created a need of tests of the mechanical properties involved in such service. At a given temperature these properties are modulus under slow or practically static conditions, dynamic modulus, energy absorption by hysteresis loss, and creep under a given dead load. In a previous paper the author presented a qualitative description of a method that might be used for these measurements.[3] In the present paper the method is developed in detail to permit the attainment of significant numerical data in fundamental physical units.

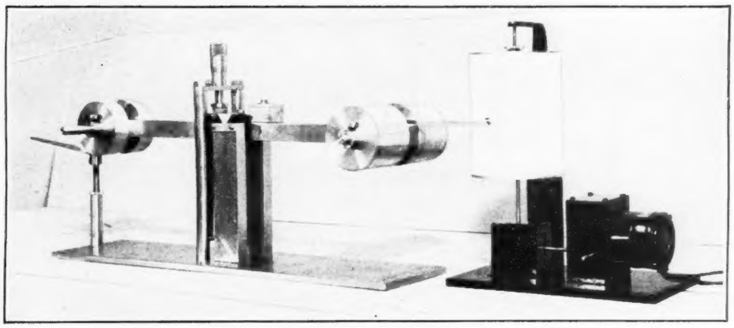

Fig. 1. The Oscillograph

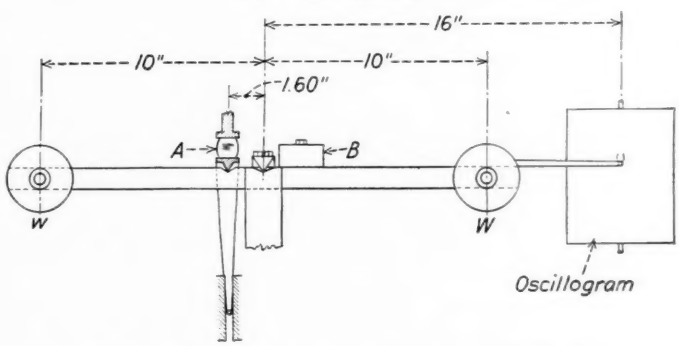

Fig. 2. A Diagrammatic Description of the Oscillograph

Principles of Static Tests

Figure 1 shows the present form of the machine. As shown diagrammatically in Figure 2, the machine consists of a balanced lever supported at its center by knife edges and a set of standard weights which may be added at one end to compress a test specimen A on the opposite side of the knife edges. A second knife edge and a stabilizing arm are introduced to render the compressing surfaces essentially parallel. Perfect balance of the lever may be obtained by adjusting the position of the counter-balance B. A pen arm extending from the heavy end of the lever automatically records deflections on the chart or oscillogram.

By an examination of Figure 2 it is obvious that the deflection of the rubber will be magnified in proportion to the lever ratio, which is 16 to 1.60. In other words a compression of 0.10-inch will be registered on the oscillogram as a vertical displacement of one inch.

The weight W in Figure 2 consists of several brass disks, each weighing 1.410 pounds. The lever ratio for the weights is 10 to 1.60. Each weight on the end of the lever, therefore, results in a force of

$$1.41 \text{ lb.} \times \frac{10.0}{1.60} = 8.82 \text{ pounds on the test specimen}$$

The test specimens are vulcanized in a cylindrical mold cavity ½-inch high and ¾-inch in diameter. Their nominal cross-sectional area is 0.441 square inch, and the unit load resulting from each weight is, therefore,

$$\frac{8.82}{0.441} = 20 \text{ pounds per square inch}$$

It can be seen by reference to Figure 1 that the upper platen or loading surface of the machine can be raised or lowered by turning the micrometer head. This feature is important because it enables compensation to be made for slight variations of test specimens from their nominal height and because test specimens not of standard size can be tested.

[1] Presented at the forty-second annual meeting of the American Society for Testing Materials, Atlantic City, N. J., June 26-30, 1939.

[2] Physicist, Rubber Chemicals Division, Organic Chemicals Dept., E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

[3] F. L. Yerzley, "The Evaluation of Rubber and Rubber-Like Materials as Vibration Absorbers," *Ind. Eng. Chem., Anal. Ed.*, 9, 392 (1937).

Analysis of Oscillations

Figure 3 shows three positions of the apparatus necessary for an analysis of the oscillations consequent to sudden release of the unbalanced lever from an elevated position. The position of the lever corresponding to zero deformation of the test specimen is shown in Figure 3(a). When the lever is released, the heavy end falls, compressing the rubber, and during the ensuing time interval the oscillations occur. The deflections of the rubber are plotted autographically against time making a graph like those of Figure 4.

At the instant of release of the lever in the position of Figure 3(a) the lever is accelerated by a torque equal to $(W\text{-}w)L$. In Figure 3(b) the lever is shown at rest with the torque due to gravity counter-balanced by the torque resulting from compression of the test specimen.

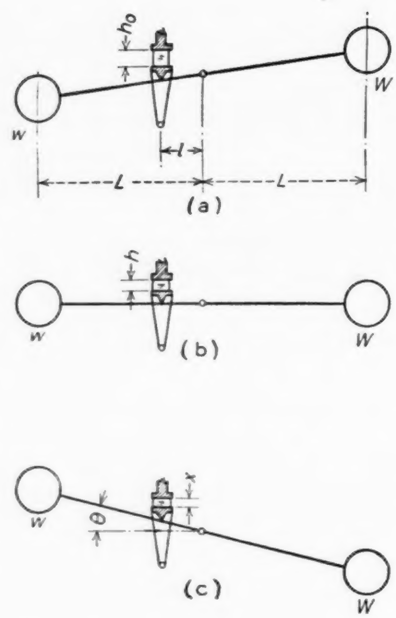

Fig. 3. Three Degrees of Compression of a Test Specimen

(a) Undeformed. (b) Static equilibrium under load. (c) Any instantaneous deformation during a dynamic test.

That is:

$$(W - w)L = K' \frac{(h_0 - h)}{(h_0)} l \qquad (1)$$

where W = weight on heavy end of lever,
w = weight on light end of lever,
h_0 = undeformed height of test specimen,
h = height of pellet under equilibrium load, and
K' = assumed spring constant.

At any instant during the vibrations the angular deflection from the equilibrium position can be represented by θ in Figure 3(c) where x represents the corresponding height of the test specimen. Therefore, at any instant, spring reaction on the loading platform $= K' \frac{(h_0 - x)}{(h_0)}$ and the corresponding torque $= K' \frac{(h_0 - x)}{(h_0)} l$. If I is the total moment of inertia of the lever and the weights about the main fulcrum and $\frac{d^2\theta}{dt^2}$ is the angular acceleration

$$I \frac{d^2\theta}{dt^2} = (W - w)l - K' \frac{(h_0 - x)}{(h_0)} l \qquad (2)$$

Substituting Equation 1 in Equation 2

$$= K' \frac{(h_0 - h)}{(h_0)} l - K' \frac{(h_0 - x)}{(h_0)} l \qquad (3)$$

$$= K' l \frac{(x - h)}{(h_0)}$$

or

$$I \frac{d^2\theta}{dt^2} - K' l \frac{(x - h)}{(h_0)} = 0 \qquad (4)$$

If the static equilibrium position of the lever is approximately horizontal, for small angles

$$\theta = \frac{h - x}{l}$$

$$\frac{d\theta}{dt} = -\frac{1}{l}\frac{dx}{dt}$$

$$\frac{d^2\theta}{dt^2} = -\frac{1}{l}\frac{d^2x}{dt^2} \qquad (5)$$

Substituting Equation 5 in Equation 4

$$\frac{-I}{l}\frac{d^2x}{dt^2} - K' l \frac{(x - h)}{(h_0)} = 0 \qquad (6)$$

$$\frac{d^2x}{dt^2} + \frac{K' l^2}{I}\frac{(x - h)}{(h_0)} = 0 \qquad (7)$$

which is the equation of motion for the oscillograph for test specimens obeying Hooke's law with K' = a constant. Let $u = x - h$

Then

$$\frac{d^2u}{dt^2} + \frac{K' l^2}{I h_0} u = 0 \qquad (8)$$

For this simple harmonic motion

$$f = \text{frequency} = \frac{1}{2\pi}\sqrt{\frac{K' l^2}{I h_0}}$$

$$\text{so } K' = \frac{4\pi^2 h_0}{l^2} I f^2 \qquad (9)$$

For standard test specimens ½- by ¾-inch in diameter

$$K' = \frac{4\pi^2 (0.50/12)}{(1.6/12)^2} I f^2 = 92.5\, I f^2 \text{ lb.}$$

The area of the test specimen, however, is 0.441 square inch so

$$K = \frac{92.5}{0.441} I f^2 = 210\, I f^2 \text{ pounds per square inch} \qquad (10)$$

where K expresses the spring constant in terms of unit load.

The moment of inertia of the lever and the weights of the particular machine under discussion is given by:

$$I = 0.0813 + n \times 0.0307 \text{ slug ft.}^2 \qquad (11)$$

where n = the total number of weights used in a given test.

The frequency of vibration is calculated from the chart by dividing a whole number of cycles by the elapsed time in seconds.

Impact Energy and Resilience

In the beginning of a dynamic test and at the instant the lever is released the lever possesses its maximum potential energy by virtue of the elevation of the heavy end. As the weight falls, part of the potential energy is converted into heat in the test specimen due to internal friction and part is stored in the test specimen by elastic compression. At the point B on the first downward sweep of the oscillation record in Figure 4(a) the lever is undergoing a reversal of direction and is momentarily stationary. Since this is the lowest point of the vibration, the potential energy of the lever is a minimum. The vertical component of the line AB is an accurate measure of the energy of the impact. Suppose the vertical length of the line AB were one inch due to the impact of one weight

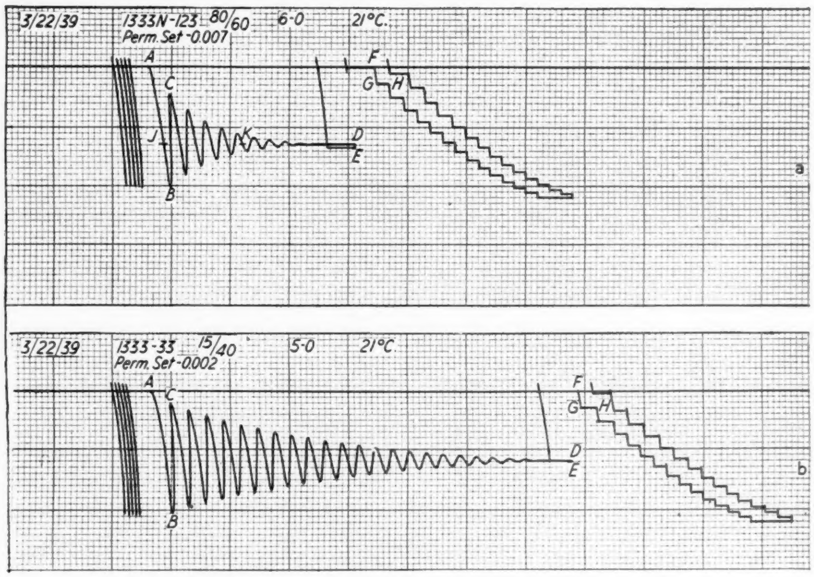

Fig. 4. Typical Oscillograms for Neoprene (*a*) and Rubber (*b*)

on the end of the lever. Then the distance through which the weight has fallen is

$$\frac{10}{16} \times 1 = 0.625$$

inch, and the corresponding energy of impact is 0.625×1.41 pound $= 0.882$ inch-pound. The volume of the test specimen is $0.500 \times 0.441 = 0.2205$ cubic inch. Hence the energy of a single weight corresponding to a one inch vertical distance on the chart is

$$\frac{0.882}{0.2205} = 4$$

inch-pounds per cubic inch of vulcanizate. Hence energy transfer in fundamental units can be calculated from maximum and minimum points on the oscillogram by the simple formula:

Energy $= 4n' \times$ vertical distance in inches on oscillogram (12)

where n' is the number of unbalanced weights on the heavy end of the lever.

It will be noted that every rising line on the chart represents return of potential energy to the lever. Hence percentage resilience may be determined by taking the ratio of the rebound height to the impact height. That is from Figure 4(*a*)

$$\text{Percentage resilience} = \frac{BC}{AB} \times 100$$

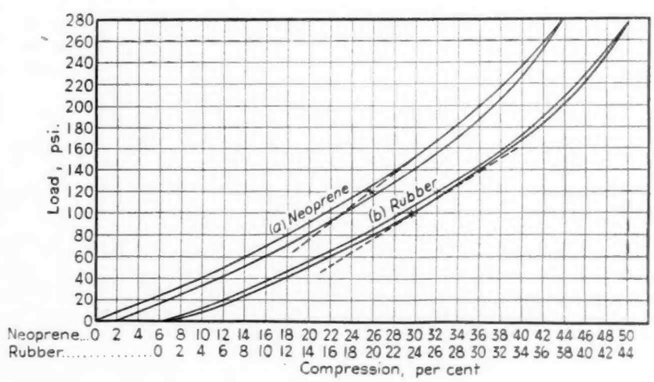

Fig. 5. Static Hysteresis Loops and Dynamic Moduli Derived from the Oscillograms of Fig. 4

Routine Measurements

It is now possible to consider specific details of the test for the measurement of the following static and dynamic characteristics:

1. Static Characteristics

(*a*) Compression loading and unloading characteristics. Load is given in pounds per square inch, deflections in inches or per cent.

(*b*) From the above data energy transfers may be calculated in inch-pounds, or inch-pounds per cubic inch of stock.

(*c*) Creep in inches or per cent. under a given dead load (load range from 20 to 280 pounds per square inch).

(*d*) Set in inches or per cent.

2. Dynamic Characteristics

(*a*) Energy absorption of impact loads in inch pounds per cubic inch of stock.

(*b*) Percentage resilience under known load, deflection range, and frequency.

(*c*) Effective dynamic modulus in pounds per square inch.

(*d*) A limited adjustment of the frequency of the test is possible.

Figures 4 and 5 illustrate the method of obtaining the data and converting it into customary forms. Figure 4(*a*) is the data sheet obtained from a Neoprene type E compound (1), and Figure 4(*b*) is a data sheet obtained for a similar rubber compound (2):

(1) Neoprene type E	100.
Extra light calcined magnesia	5.
FF wood rosin	2.
Phenyl-b-naphthylamine	2.
Sulphur	1.
Litharge	3.
Cure—80 min. at 141.7° C. (287° F.)	
Durometer A hardness—41	

(2) Smoked sheets	100.
Zinc oxide	5.
Stearic acid	1.
Phenyl-alpha-naphthylamine	1.
Tetra-methyl-thiuram-monosulphide	0.3
Sulphur	3.
Cure—15 min. at 152.8° C. (307° F.)	
Durometer A hardness—39	

In Figure 5 curves (*a*) and (*b*) are derived from the oscillograms shown in Figure 4(*a*) and (*b*), respectively.

Referring to Figure 4(*a*), the reference line is traced around the recording drum as the first step in any test. This is done with the heavy end of the lever held in the position corresponding to zero deformation of the test specimen by allowing the recorder drum to rotate through one revolution. Reproducible results are obtained only on test specimens which have been through several cycles of loading and unloading. For that reason, before beginning the oscillogram proper, several complete sets of oscillations are run, but are recorded only as arcs as shown on the left end of the oscillogram in Figure 4(*a*). It will

be seen that the lower end of each of these arcs can be compared with its predecessor to observe whether or not the same compression is being obtained on successive trials. It is, of course, necessary that the weights used for the conditioning cycles be the same as those to be used in the test. For the oscillogram of Figure 4(*a*) six weights were used on the heavy end imposing an average load of 120 pounds per square inch on the test specimen.

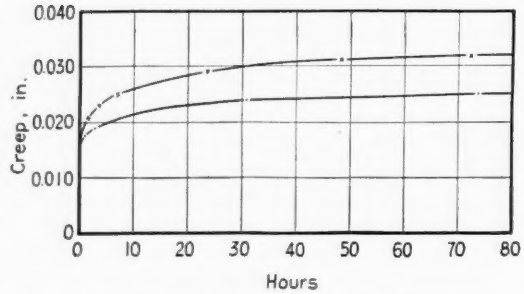

Fig. 6. Creep Data Obtained on the Oscillograph for Two Neoprene Compositions under 240 Pounds per Square Inch

With the heavy end in an elevated position, the motor drive was turned on, and when the pen reached point *A*, the hook was released, and the oscillations were recorded. After the oscillations were damped out and the record became a smooth line, the drum was stopped and a vertical line was traced as the test specimen slowly compressed further under the load. The length of this line after any time interval is a measure of creep. At the end of two minutes the drum was rotated a short distance by hand to mark the end of the line *DE*, and the heavy end of the lever was fastened in its original position by re-engaging the hook. Since creep had occurred, the pellet no longer filled the distance between the two loading platforms. By turning the micrometer head, the upper platen was brought down to the new height of the pellet. The distance it moved was recorded as the set. In the test under discussion, this was recorded as 0.007-inch. The creep which occurred during the same time interval of two minutes was 0.006-inch. There is no apparent reason why these two figures should check accurately, since one figure represents change in height under load and the other change in height of the unloaded pellet. After measuring the set the micrometer was returned to its former setting.

Measurements of creep and set over relatively short time intervals can be of only limited usefulness. A few comparisons between the short-time drift and drift over longer periods of time have indicated, however, that in a given class of compositions there may be a rough correlation between short-time drift and the total creep which would occur over longer periods of time. By plotting creep against time, curves of the type shown in Figure 6 may be obtained.

After completion of the creep test, the drum was then rotated so that the pen rested on point *F*, and at this point all weights were removed from the machine. The hook was then held back, and one weight was added to the pen end of the lever. Compression under the load of 20 pounds per square inch is represented on the chart [Figure 4(*a*)] by the line *FG*, after which rotation of the drum by hand caused the line *GH* to be drawn. Weights were added stepwise in this way to the full load capacity of the machine, 280 pounds per square inch, and were then removed one by one in order to obtain unloading data. The deflections corresponding to these loads were replotted on load compression axes to obtain the hysteresis loop shown in Figure 5(*a*).

From the static loading and unloading curve thus obtained, it is possible to calculate the energy in inch-pounds per cubic inch of stock required for compression to any desired extent. This is done by measuring the area under the curve up to the desired percentage of compression and expressing the area in terms of the quantities plotted on the axes. For example, one square on the curve sheet corresponds to a load of 20 pounds per square inch multiplied by a deflection of 2% in a test specimen one inch high. The energy is, therefore, 20 by 0.02- or 0.4-inch-pounds per cubic inch of stock. For a specific example, consider compression of 40.4% on the curve of Figure 5(*a*). The area under the loading curve up to this point gives an energy value of 41.4 inch-pounds per cubic inch.

Again referring to Figure 4(*a*), the length of the line *AB* can be used to calculate the energy of the impact which caused the compression of 40.4%. This calculation, based on Equation 12, is 4 by 6 by 2.02 = 48.4 inch-pounds per cubic inch of stock. If the static characteristics of this Neoprene and its characteristics at the frequency of the dynamic test are the same, the impact energy should be the same as that previously calculated from the static load-compression curve. There is a discrepancy, however, and the dynamic energy is greater than that calculated from the static curve. The percentage resilience of the compound under these load conditions can be calculated from the ratio of the vertical heights of the lines *BC* and *AB*. This figure is 1.58 divided by 2.02 = 78.2%. It should be noted, however, that this value of the resilience was determined for the compound at 21° C. at the stated load, deflection range and frequency; and that a change in one of the variables might change the resilience.

We now come to the calculation of effective modulus in pounds per square inch. The calculation of frequency in this case is based on five cycles and on elapsed time of 1.35 seconds so that f = 5 divided by 1.35 = 3.70 cycles per second, where 1.35 is the distance *JK* in Figure 4(*a*). Therefore, f^2 is 13.8 and from Equation 11, $I = 0.0813 + 6 \times 0.0307 = 0.2655$ slug feet². Substituting in Equation 10, $K = 210 \times 0.2655 \times 13.8 = 769$ pounds per square inch. If the static and dynamic characteristics of Neoprene were the same, this calculated value for the dynamic modulus should be numerically equal to the slope of the tangent drawn to the static load-compression curve shown in Figure 5(*a*) at the load of 120 pounds per square inch. For purposes of demonstration, however, it is more convenient to plot the value of *K* on the load-compression curve by drawing a straight line of the proper slope at the point corresponding to the point *D* in Figure 4(*a*). At the point *D* the load is 120 pounds per square inch and the compression is 25.6%. This point is indicated on Figure 5(*a*) by the cross, and the dotted line represents the dynamic modulus. Here it can be seen that the effective dynamic modulus is greater than the static modulus represented by the slope of the load-compression curve at 120 pounds per square inch.

The frequency of the test is determined by the value of *K* and the inertia of the machine. At a given load *K* cannot be independently varied, but within a restricted range the inertia of the machine can be varied. For example, for the test of Figure 4(*a*) there were six weights on one end of the machine and no weights on the other. The same load could have been obtained by using ten weights on one end of the machine and only four on the other. This would have increased the inertia of the machine and decreased the frequency of the test. For brevity,

additional data are not given here. It appears, however, that a greater difference in frequency must usually be used than is possible by this method in order to measure the effect of test frequency upon the value of the dynamic modulus.

For simplicity the foregoing discussion has been based upon the test of Neoprene illustrated in Figure 4(*a*). It will be understood that the test is equally applicable to rubber and other rubber-like materials. For example, similar calculations can be made for the data in Figure 4(*b*) for rubber. The static and dynamic moduli are illustrated in Figure 5(*b*), and it is significant that they are within experimental error the same. In this respect they differ from the results for Neoprene. In further confirmation of the difference between the Neoprene compound and the rubber compound, the energy values also correspond for the static and dynamic tests. The energy imparted to the rubber by the impact in Figure 4(*b*) is $4 \times 5 \times 2.05 = 41.0$ inch-pounds per cubic inch of stock. The area under the curve up to 41% compression gives 40.4 inch-pounds per cubic inch of stock. This also seems to be in almost perfect agreement with the value obtained from the dynamic test.

It is likely that the difference between static and dynamic characteristics are linked in some specific way with the damping factor of a given compound: that compounds having high resilience will show the least difference between static and dynamic characteristics and that the discrepancy between the two is in general widened as the resilience decreases. It is important to emphasize, however, that the value K is given as an effective dynamic modulus, but not an actual physical modulus. It is in a sense a fictional quantity. Actually the oscillations do not occur over a linear load-compression relation except for small deflections near zero load and for heavily reenforced compositions. However the dynamic modulus is a quantity which has greater significance with respect to vibration calculations than any value that could be taken from the static curve.

Brevity requires that discussion of certain details be restricted to brief statements. The mathematical derivations, for example, have been confirmed by tests of a calibrated coil spring. With respect to the molded test specimens, the use of nominal rather than actual dimensions seems justified since mold shrinkage is characteristic of a given vulcanizate either in the preparation of test specimens or in the manufacture of articles in production. Test specimens can be prepared in other ways than molding as special circumstances may require. Slight errors in testing have been noticed due to frictional losses between the surface of the test specimen and the compressing platens. These errors may be eliminated by using test specimens adhered to metal end plates.

Conclusions

The oscillograph described has been developed primarily as a laboratory instrument to evaluate rubber and Neoprene compounds for mechanical applications. It is complete in itself as a means of measuring all of the quantities inherently involved in such service in units which are understandable to rubber technologists and mechanical engineers alike. It is hoped that it may serve its purpose by bringing into closer cooperation those who make and those who use rubber springs. The details of the test have been carefully developed, and it is expected that the machine and standard test specimen described will not need essential modification for routine use. However enough background has been given so that the machine may be modified in accordance with definite principles in order to gain greater load capacity if required. The test has been restricted thus far to compression. The author expects to adapt the machine to tests in shear, and by correlation between shear data and compression data to obtain figures capable of substitution in relation already offered by other investigators[4] for calculations in the applications and design of rubber springs. This field of calculation is complicated and in an early state of development, but by the use of the oscillograph it should be easier to obtain the quantities of information required to clarify our understanding of the mechanical characteristics of rubber-like materials within the range of deformation encountered in structural use.

[4] C. F. Hirshfeld and E. H. Piron, "Rubber Cushioning Devices," *Trans. Am. Soc. Mech. Engrs.*, 59, 471 (1937); E. H. Hull, "The Use of Rubber in Vibration Isolation," *Ibid.*, 4, A109 (1937); J. F. D. Smith, "Rubber Mountings" *Ibid.*, 5, A13 (1938); F. L. Haushalter, "The Mechanical Characteristics of Rubber." *Ibid.*, 61, 149 (1939).

Polish Rubber Industry

(*Continued from page 36*)

1937, and there was considerable expansion in this direction in 1938 and 1939. In 1935, 1936, and 1937, the above companies wrote off a total of 5,050,000 zloty for amortization; their reserves were increased by 914,000 zloty; net profits amounted to 4,216,000 zloty for eight companies, but losses by the two other firms reduced this amount to 2,267,000 zloty. To get an idea of the position of the entire industry these figures would probably have to be doubled. One may say that, on the average, Polish rubber manufacturers within the three years stated managed to get back out of the industry about 60% of the value of the machinery and technical equipment as this stood in 1935, and 45% of this value as it stood in 1937, and that they are able to finance investments (in plant and equipment) out of profits.

As already mentioned above, individual enterprises in the Polish rubber industry are able to show far more favorable results, but these are obscured by the losses booked by other firms. We may also add that in one case the considerable losses lately shown were not made in recent years, but have only now, after years of delay, finally been written off. Conditions are actually more favorable than might be concluded from the above average figures.

Bitumen-Rubber Mixtures

(*Continued from page 39*)

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"Improved Material for Fitting Joints Combines Asphalt and Rubber." *Construction Methods*, Feb., 1937, p. 60.

"Latex-Bitumen Joint Filler." *Rubber Age (N. Y.)*, Mar., 1937, p. 362.

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"Rubber for Paving." F. Jacobs, *Caoutchouc & gutta-percha*, 34, 283 (1937); *Chem. Ab.*, 32, 151 (1938).

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Editorials

A Centenary Industry

THE founding and building of the rubber industry is rather exceptional in the fact that it was made possible by a single discovery which has stood the test of one hundred years and for which there has been found no commercially competitive substitute. Although the industry could not have been created without this secret of altering the physical characteristics of natural rubber, likewise it could not have been developed to its present state of service without the many advancements in practical technique and application that have been made possible through the efforts of those workers with rubber who have followed Charles Goodyear.

The major improvements have come about during the lifetime of many companies and individuals that are still active. While it is fitting that honor should be paid this year to the discoverer of the basic principle, those who have been active during the present century can justly assume much credit and satisfaction from the industry's accomplishments. While special groups have and may continue to honor Charles Goodyear, the greatest tribute can best be given by the rubber industry as a whole to all those including Goodyear who have been connected with it from the time of its inception to the present.

From September 13 to 15 inclusive the American Chemical Society, and more specifically the Rubber Division, will celebrate at its Boston meeting the one hundredth anniversary of the founding of the rubber industry. The A.C.S. may well be considered the proper medium for such an event, and the rubber industry as a whole has this opportunity of accentuating the scope and importance of the rubber industry. Active participation by all who are interested in popularizing rubber will effectively assist in impressing upon the public the fact that the rubber industry is progressive and is increasing the utility of its products. This celebration by the industry and for the industry is an opportunity such as is rarely experienced and is deserving of whole-hearted support.

Tire Safety Campaign

THE period from June tenth to the twenty-third was originally designated for the Summer Tire Safety Campaign organized by tire retailers and manufacturers to promote highway safety by emphasizing to motorists the hazard of driving on tires that have lost their anti-skid qualities or are approaching a condition where failure is only a question of time.

Tires form the only contact between the automobile and the road and thus become the only means of holding the car directionally on the road. Driving speeds and traffic congestion today place great reliance upon the contact friction or anti-skid factor between tire tread and road surface. Because of the natural lubricating effect of water on a smooth rubber surface maximum safety requires that the tread surface perform a wiping and gripping action such as can be done only with a grooved surface.

Because of the exceptionally heavy travel by automobile as is anticipated for this summer, the accident liability will be greatly increased, and the toll of lives and injuries will rise unless unusual precautions are taken. As a constant reminder of the vital effectiveness of well-treaded and safe tires, this campaign can be of great value in promoting safety, but the greatest results can be obtained only if all people who are associated with tire distribution will enter whole-heartedly and do everything possible to emphasize this important factor to the motorists. As the title of this campaign suggests, this activity can well be extended throughout several months. The display of banners and placards by tire retailers, energetic activity by those who contact the motoring public, and enthusiastic cooperation by tire manufacturers will result in an abundant harvest in human welfare and also increase the sales of the rubber industry's most popular product.

Skilled Worker Supply?

IT IS quite certain that at some future time the rubber industry as well as some other industries will be called upon to increase production at an unusually rapid pace and will be faced with a shortage of skilled labor. Because of extended unemployment the skill of many of the former artisans has become impaired, and thus little relief can be expected through former employes. Aggravating this situation is the fact that the active supply of trained workers is being depleted through retirement because of age.

The new wages and hours regulations are such that it is uneconomical for companies to train apprentices for future needs. Unless these regulatory practices can be made such as will foster the training of new employes, industry will from economic necessity exert unusual effort toward the development of machines, and thus a diminished labor consumption may well be expected.

S. C. Stillwagon

EDITOR

What the Rubber Chemists Are Doing

A.C.S. Rubber Division Activities

Boston Meeting

MEMBERS of the Centennial Program Committee and officers of the Rubber Division, A.C.S., wish to stress the unusual significance of the Goodyear centennial meeting to be held this fall in Boston. They point out that the responsibility for seeing that this historic event is properly commemorated falls upon the shoulders of the Rubber Division. To achieve success each member must assume his individual share of the load; the preparation of a sufficient number of high-quality papers and a good attendance are responsibilities of the membership.

Headquarters of the division will be at the Parker House, where the technical sessions also will be held. Members are urged to make reservations at once as it has been reported that rooms are already becoming scarce. In addition to this special technical program, the division is cooperating in two symposia: Plastics and Resins from Petroleum, Monday, September 11, with the Petroleum Division and the Paint and Varnish Division; X-Ray Structure of High Molecular Weight Substances, Tuesday, September 12, with the Division of Colloid Chemistry and the Division of Inorganic Physical Chemistry.

Los Angeles Group

OIL and its relation to the rubber industry formed the theme of the dinner meeting held on June 10 by the Los Angeles Group, Rubber Division, A.C.S., at the Mayfair Hotel, Los Angeles, Calif. The meeting, attended by 126 members and guests, concluded the group's technical activities for the 1938-1939 season.

Charles Lamb, Sr., vice president and general manager, West American Rubber Co., discussed the part that rubber plays in the oil industry, describing some of the numerous rubber articles used in the oil fields. A second speaker, Dr. C. Douglas Barnes, supervisor of research, Union Oil Co., spoke on the origin, growth, and present-day refining processes of the oil industry. A motion picture, "Petroleum Geology," which traced the early history of petroleum, was shown by Dr. Barnes. His concluding remarks pointed out the uses of petroleum products in the rubber industry.

As an added feature, T. Kirk Hill and E. Royal presented movies of their recent fishing trip to Guaymas, Mexico, where they successfully fished for marlin. Three door prizes and a special prize, each a picnic set comprising a set of Thermos bottles and sandwich box in a leather case, were donated by Godfrey L. Cabot, Inc., through its representative, B. E. Dougherty. Prize winners were: L. O. Smith, National Standard Co.; C. Prowten, Latex Seamless Rubber Co.; J. D. Foulds, Olympic Rubber Co.; and W. Michalak, MacClatchie Mfg. Co.

The program committee announced that the annual fishing trip would be held at Catalina, probably August 11-12. The next technical meeting of the group will be held on October 3.

Essay Contest

MUCH interest has been displayed in the essay contest being conducted by the New York Group, Rubber Division, A.C.S., for those men under 35 years of age who are interested in rubber, and a number of entrants have indicated their intention to submit papers. While September 1 has been set as the closing date for receiving the papers, the committee desires that where possible the papers be submitted well in advance of that date so as to avoid placing an extreme burden on the judges in the final period.

The committee wishes to emphasize the fact that in case of a tie between two or more papers preference will be given in the order of the date on which the papers were received. If you intend to enter this contest, send your paper in at an early date.

Conditions of the contest were announced in circular letters to the membership and were published on page 45 of the May issue of INDIA RUBBER WORLD. Further information may be obtained by writing to the editor.

Boston Group

PLANS have been completed for the annual summer outing of the Boston Group, Rubber Division, A.C.S., which will be held on July 14 at the Weston Golf Club, Weston, Mass., the scene of last year's outing. Among the outdoor activities scheduled for the day are golf, softball, and tennis, the winners of which will be awarded prizes. Dinner will be served in the club banquet room at 7 p.m.

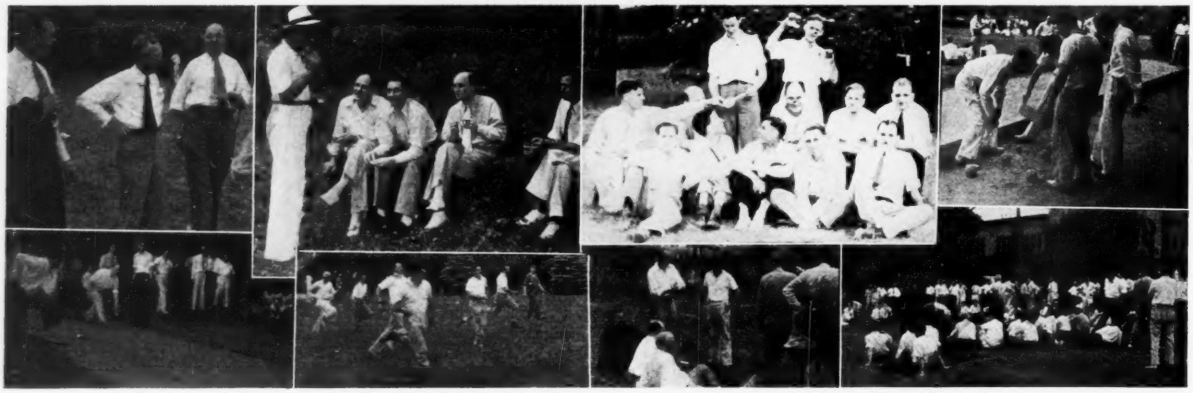
New York Group

A DAY of sport and relaxation was thoroughly enjoyed by the 160 who attended the annual outing of the New York Group, Rubber Division, A.C.S., at Alps Castle, Preakness, N. J., on June 10. Numerous sport events were held during the morning and afternoon, the outdoor activities being concluded with a battle royal among five darkies, an added feature of the day. At noon a generous cold-plate luncheon was served, and the program in the evening was concluded with an excellent chicken dinner during which 37 prizes, supplied by the group itself, were distributed to winners of sporting events and lucky ticket holders. Fred Traflet (Pequanoc), chairman of the outing committee, was given a vote of thanks for his efforts in providing what was generally considered to be one of the best outings ever held by the group.

In the golf tournament J. De Reimes (Bakelite) took low gross, and S. W. Mackenzie (U. S. Rubber) had low net. The kickers' handicap was won by W. S. Woodward (American Zinc Sales) and H. W. Smith (Thompson-Weinman); while J. R. Keating (Binney & Smith) had high score. In the softball contest the "Peddlers," led by J. Miscall (Flintkote) defeated the "Chemists," and the "Single Men," captained by E. Osberg (INDIA RUBBER WORLD) beat the "Married Men." The tug-of-war was won by a team headed by J. DeC. Van Etten (Vansul).

Other sporting events and their winners follow: Tennis—J. Ball (Vanderbilt), with E. T. McKay (Manhattan), second; Boccie—G. Grove and E. B. Snyder (N. J. Zinc), first, and R. D. Gartrell and R. H. Gerke (U. S. Rubber), second; Horseshoes—W. F. Lamela (Okonite), first, and P. Grinwis (Manhattan), second; Baseball Throw—B. Atchinson (Pequanoc); Fat Men's Race—G. McNamara (Pequanoc); Flyweight's Race—A. Schwartz (Wishnick-Tumpeer); Three-Legged Race—B. Atchinson and G. McNamara; Backward Race—A. Schwartz; and Sack Race—B. Atchinson.

Those in charge of the various activities who contributed measurably in making the affair an outstanding success were: Golf—G. Provost (U. S. Rubber); Soft Ball—L. Lawrence (Du Pont); Races—L. Edland (Vanderbilt); Boccie—J. Carroll (R. E. Carroll); Tennis—M. E. Lerner (*Rubber Age*),



Some Candid Shots Snapped by E. H. Krismann at the New York Group Outing, June 10

Horseshoes—W. Lamela; Baseball Throw—D. Scott, Jr. (Henry L. Scott); Tug-of-War—J. R. Keating. J. Miscall was master of ceremonies, aided by W. Lingvall (U. S. Rubber). B. B. Wilson (India Rubber World), group secretary, and P. P. Pinto (*Rubber Age*), ably assisted by P. Murawski (Du Pont), were in charge of prizes; while J. DeC. Van Etten handled the beer. Walter Grote (United Carbon) entertained the group throughout the dinner with violin music. Jimmy Berg, pianist, composer, and orchestra leader, accompanied Walter on the piano.

Akron Group

APPROXIMATELY 400 members and guests enjoyed the annual outing of the Akron Group, Rubber Division, A.C.S., held at the Silver Lake Country Club on June 16. J. B. Waite, of the Dugan Campbell Co., general chairman, was assisted by 26 members in making arrangements for the event. After a day of outdoor activities, featuring golf, dinner was served followed by the distribution of approximately 100 prizes, made possible through the contribution of generous donors.

Prize winners of the golf tournament, which attracted 150 participants, follow: long drive—(1) R. Atwood and (2) A. E. Lauchiskis; low gross—(1) J. F. Beal with 74 and W. H. Lewis, Jr., with 76; consolation high gross—T. Thompson with 165.

Chicago Group

THE Chicago Group, Rubber Division, A.C.S., held its first annual outing on June 21 at the Glenbard Golf Club, Glen Ellyn, Ill. The club's facilities were available all day for group members playing golf, and the capable arrangements were in the hands of the golf committee headed by O. Selander, assisted by Robert Cryor and O. J. Urech. An appetizing steak dinner was served at 7:15 p.m., when prizes were distributed.

Colloid Symposium

The Sixteenth Colloid Symposium will be held by the Division of Colloid Chemistry, A.C.S., from July 6 to 8 at Stanford University, Calif. Among the 28 papers to be presented are two which directly relate to rubber: "Molecular Weight of Sol and Gel in Crude Hevea Rubber," by A. R. Kemp and H. Peters, and "The Elasticity of Natural and Synthetic Rubber as Statistical Effect," by H. Mark.

Improved Flectol H

Chemically identical with the older material of the same name, a new improved Flectol H has been recently announced by the Monsanto Chemical Co., Organic Chemicals Division, Rubber Service Department, Akron, O. The new antioxidant is said to minimize discoloration effect to a much greater extent than did its predecessor, and in addition, it is somewhat lighter in color and has a lower apparent density. It is also reported to be particularly suitable for use with latex.

Protective Film-Forming Resin

A COMBINATION of synthetic resins, known as Impervium, is said to possess and retain over a long period rubber-like flexibility and elasticity and at the same time offer a high resistance to acids, alkalies, and oils. In addition films formed from Impervium have good dielectric properties and will not burn although they do char. Aging appears to have no influence on the flexibility and strength of the film. Although its resistance to corrosive agents covers a wide field, the product will not withstand concentrated sulphuric acid at elevated temperatures, and some metal salts are injurious. In general, temperatures above 160° F. should not be used.

Application of the new product requires a special technique under controlled conditions. It will adhere to metal and rubber. In the latter case Impervium forms a film that will protect the rubber against corrosive agents, oils, and sunlight. The resin combination is applicable for: all types of units used in the plating industry; tank and pipe linings for chemicals; electrical units; protection of metals; and many other similar purposes. At the present time production is limited, but it is expected that Impervium will be soon ready for general industrial distribution.

Delayed-Action Activators

The Delacs, as the name implies, are delayed action activators for use with other accelerators of vulcanization and particularly with mercaptobenzothiazole and its derivatives. The activators, which were announced recently by the Naugatuck Chemical Division of United States Rubber Co., 1790 Broadway, New York, N. Y., are salts of diphenyl guanidine and organic acids. They may be used to obtain the full advantage of straight guanidine activation during vulcanization, but with much greater safety and freedom from scorch. The acid portion of their composition governs the degree of delay obtained.

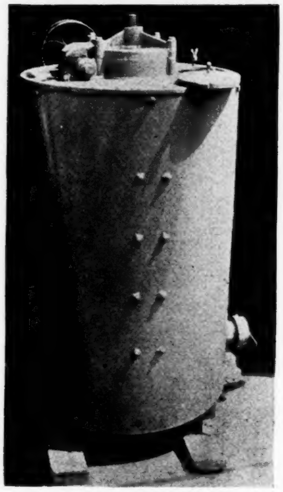
There are three Delacs, all free flowing white powders: Delac A—diphenyl guanidine acetate which shows only a slight delayed action as compared with straight diphenyl guanidine; Delac P—diphenyl guanidine phthalate which exhibits a medium degree of delayed action; and Delac O—diphenyl guanidine oxalate which shows an advanced degree of delayed action.

Stiffening Agent

Santocel, a product of the Monsanto Chemical Co., Merrimac Division, Boston, Mass., is silica gel from which the water has been removed by a process which does not destroy the original gel structure. It is used in crepe rubber for soles and in white or transparent compounds. Extremely light in weight and porous, Santocel has an apparent density of 7.5 pounds per cubic foot. It is white transparent in color and

(*Continued on page 59*)

New Machines and Appliances



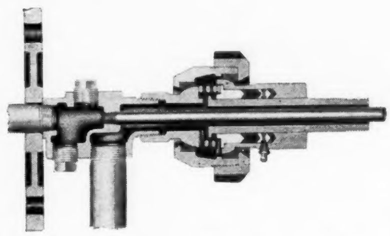
Churn Equipped with Norton Gear Assembly

Gear Assembly for Rubber Cement Churns

THE Norton gear assembly and churn cover, built as a single compact unit, is designed to fit a standard 36-inch churn for mixing and agitating rubber cements or other types of liquids. The gear assembly, comprising a worm gear drive and end thrush bearing, is completely enclosed and runs in oil. The new unit does away with the old type of bevel gear assembly with exposed gears and hangers and is said to provide smooth, silent, and long-life operation. Because friction is reduced, fire hazard is lessened. Easily attached to the churn body, the cover and drive unit is available for gear replacement purposes. A 200-gallon churn equipped with the new assembly is also obtainable for new machinery requirements. M. Norton & Co.

Revolving Pipe Joint

A REVOLVING joint which provides free movement in all directions is used to supply steam, gas, or other fluids from a stationary supply pipe to a rotating drum or member without leakage. A rotatable sleeve, through which the fluid passes, provides for the revolving action of the attached drum and also has sufficient sliding movement to compensate for end play in the revolving member. Eccentricity of movement is permitted by two ball surfaces which also provide flexibility to adjust for any slight misalinement when the joint is applied. When it is desired to feed two different fluids into the revolving drum or to remove condensate through the same opening, a syphon adapter, essentially a small pipe section within the main pipe section of the joint, is incorporated in the assembly. Barco Mfg. Co., 1801 Winnemac Ave., Chicago, Ill.

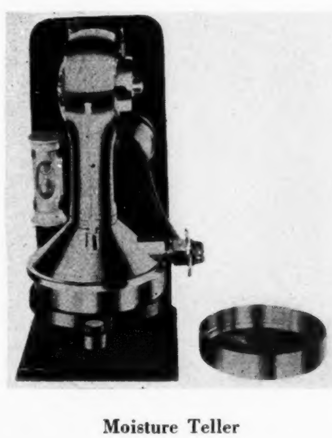


Barco Revolving Joint with Syphon Adapter

Moisture Determination Apparatus

FOR rapid and accurate moisture determinations without the use of an oven, a new appliance, known as the Moisture Teller, has been developed. Said to be applicable to the moisture determination of many different materials including those used in the rubber industry, the apparatus may be located in the laboratory or in the plant at convenient control stations. The Moisture Teller dries by forcing heated air through the sample to be tested, with the air temperature being above the boiling point of water. Thus the moisture in the sample flashes to steam and is blown out through a 500-mesh filter cloth bottom of the sample pan. Most materials will completely dry in about 45 seconds. The temperature of the drying air may be selected between 150° and 260° F. by use of the proper heating element. Standard equipment utilizes a heating element producing air at 235° F. In installations requiring various temperatures a rheostat may be incorporated to regulate the air temperature between 160° and 235° F.

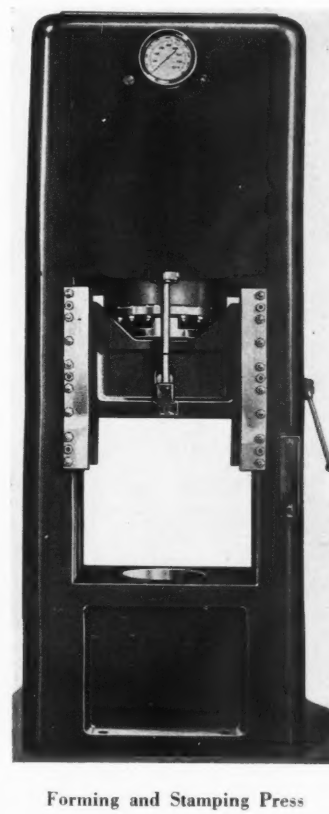
The apparatus weighs 8½ pounds, has an overall height of 12½ inches, and requires a current of five amperes at 110 volts or 2½ amperes at 220 volts. Supplementary equipment includes three drying pans, counter weight which is 50 grams heavier than the pans, oil, forceps, brush, and scoop. Harry W. Dietert Co.



Moisture Teller

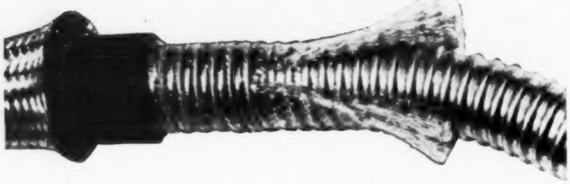
Metal Press

SUITED for forming and stamping many of the metal parts to be used in rubber-to-metal assemblies, the hydraulic press illustrated is a self-contained motor-driven unit, built in capacities of from 150 to 1,500 tons. Operation of the press is by push button, although a single hand lever is provided by means of which the speed and operation of the ram may be controlled. French Oil Mill Machinery Co., Piqua, O.



Forming and Stamping Press

New Goods and Specialties



Avioflex Hose

Cutaway View of U. S. Royal Raymaster Truck Tire

Oil Hose

AVIOFLEX, a new type of hose for oil connections comprises an inner flexible metal tube covered by a multiple cellulose sheet. A synthetic rubber cover binds the unit together and gives it added strength and body; while an external metal braid provides protection from external injury and prevents elongation under internal pressure and external end-load. The cellulose sheet, impervious to oils and all hydrocarbon fluids under elevated, normal, and subnormal temperatures, provides a positive seal over the entire tube. The synthetic rubber in Avioflex is used only as a covering element and is protected from contact with the conducted fluid by the cellulose layers. Chicago Metal Hose Corp.

Ice Cube Container

A COMPACT, lightweight ice-cube container, known as the Frigidette, is made of soft molded cell-tite Rubatex (expanded rubber) ½-inch thick to offer adequate resistance to heat penetration. Weighing less than a pound, the container is eight inches high and six inches in diameter. The Frigidette holds 24 to 36 ice cubes and, it is claimed, will keep them from 12 to 24 hours. It is made in bright colors: red, blue, green, yellow, and white, with a contrasting plastic knob. Rubatex Distributors, Inc.

Rubatex Frigidette

Rayon Cord Truck Tire

RECENT improvements in the manufacture of rayon cord have been incorporated in the construction of a new U. S. Royal Raymaster truck tire. Made in the full line of sizes, the new tire has, in addition to its rayon cord construction, two shock pads and a streamlined deskidded tread. The Raymaster, according to its makers, offers up to 136% greater mileage, depending on operating conditions, than conventional truck tires. U. S. Tire Dealers Corp., 1790 Broadway, New York, N. Y.

Spectrafilm—Rubber Hydrochloride

AN IMPROVED, stabilized rubber hydrochloride sheet material, identified as Spectrafilm, is said to be ideally adapted to use for bathroom and kitchen curtains and to make excellent drapes for living rooms. Anticipated advantages over existing materials include: may be cleaned with a damp cloth; is resistant to action of sunlight; is impervious to water; is more flame resistant than other common curtain materials; is inexpensive.

Spectrafilm may be had in the following colors: red, peach, dusty rose, Nile green, transparent silver, transparent gold, powder blue, corn, and clear. Ultimately it will be available in practically any conceivable color. The colors are all milky-transparent, and the sheeting has a rich gloss on each side. Goodyear Tire & Rubber Co.

The Above Photograph Illustrates Some of the Newer Applications of Pliofilm, a Derivative of Rubber and Technically Known as a Stabilized Rubber Hydrochloride, Which Is Available in Rolls of Widths Varying from ⅝-Inch to 40 Inches, in Five Gages, the Least of Which Is 0.001-Inch, and in Crystal Clear or Attractive Colors

Rubber Industry in America

EASTERN AND SOUTHERN

A RECENT government report reveals that after a rapid growth in the second half of 1938 business activity has failed since the beginning of 1939 to show the usual seasonal advances in many industries. Current business is irregular, with the general trend downward; but very recently a more cheerful outlook has appeared. Although fundamental factors for the short term view are, in general, favorable, what is lacking at the moment is a real stimulus to start a strong recovery. Indications are, however, that an upturn may take place during the third quarter of the year.

Unfavorable factors include the international situation, which, however, seems to have improved somewhat lately; the labor disputes in the automotive industry; the drop in automobile output, cotton mill operations, and footwear production; large stocks of gasoline, although production is declining; and crop prospects not so good as last year. Favorable factors include the settlement of the coal strike; the seasonal activity in construction work and industries supplying materials therefor; greatly increased demand for electrical appliances; the contra-seasonal increase in steel-ingot production, which, from the low for the year of 45.4% capacity the third week in May, rose to 54.2% early in June and then fluctuated to 54.3% late in the month; and the recent spurt of the machine tool index to a two-year high.

C. K. Williams & Co., manufacturer of dry colors and fillers, Easton, Pa., recently announced that E. G. Davies has been elected secretary and has assumed general direction of the sales and credit departments and that W. H. Lucking will have immediate charge of sales. Mr. Davies has been with the company 22 years, principally in sales work; while Mr. Lucking, with the company eight years, has devoted himself entirely to sales.

The New Jersey Zinc Co., 160 Front St., New York, N. Y., according to President J. E. Hayes has elected Marshall L. Havey a vice president of the company and its subsidiaries. Mr. Hayes also announced that Ralph M. Neumann has been appointed general sales manager, but will continue as manager of the pigment division of the New Jersey Zinc Sales Co.; while Arthur E. Mervine has been named assistant general sales manager and will continue as manager of the metal division of the sales company.

Seventeenth Exposition of Chemical Industries

The Seventeenth Exposition of Chemical Industries may exceed all of its predecessors in size and scope, according to advance indications of exhibitor response. The exposition will be held at Grand Central Palace, New York, N. Y., December 4 to 9, 1939. Three entire floors of the Palace are reserved for the event, and at this time, six months before the exposition, two floors and more than half of the third are now engaged by more than 260 exhibitors. While most of the exhibitors have appeared in previous expositions, the number of new exhibitors this year is greater than in 1937.

This is a unique market-place where actual equipment, much of it in operation, can be observed. Attendance at the last exposition, totaling 46,290, came from 45 states in the United States and from 130 cities and towns in 47 foreign countries.

The chemical exposition is this year observing its twenty-fifth anniversary of service to the chemical industries. Since it was founded in 1915 there have been 16 previous appearances, and the exposition is now established on a biennial basis. Principal sections are chemicals and chemical products, laboratory equipment and supplies, instruments of precision, materials handling equipment, brewing, distilling, and bottling equipment, containers and packaging machinery, industrial chemical equipment and machines.

This exposition will be under the personal direction of Charles F. Roth, president of the International Exposition Co., who has directed all of the expositions since their inception in 1915.

U. S. Rubber Changes

United States Rubber Co., 1790 Broadway, New York, N. Y., through Harry J. Haflin, general sales manager, General Products Division, has announced the appointment of John W. Sproul as sales manager of the golf ball department. He has been with the department 15 years and for the last ten was assistant sales manager.

Henry S. Marlor, formerly assistant general manager of the Footwear Division, has been made general manager, succeeding T. J. Needham, who also is a vice president of U. S. Rubber and a member of the executive board. Mr. Needham, however, will supervise the Footwear Division.

H. B. Spencer has assumed new duties as assistant director of Industrial and Public Relations for the U. S. Rubber with headquarters at 1790 Broadway. Mr. Spencer has been in industrial relations work for 20 years at various factories of the company.

The Detroit sales branch of U. S. Rubber and of U. S. Tire Dealers Corp. has moved from E. Jefferson Ave. to 5850 Cass Ave., where all main divisions of the company, including footwear, U. S. Royal foam sponge mattress, clothing, mechanical rubber goods, insulated copper wire and cables, and general products, as well as U. S. Tire Dealers Corp. are now located. The former branch for many years occupied a building adjacent to the Detroit factory. Increased business and added activities, requiring approximately twice the floor space of the old location, necessitated the move. Executives of the Detroit branch are: sales managers, E. F. Busdieker, mechanical rubber goods; W. F. Pressey, general products; J. E. Rutter, footwear, clothing, and foam sponge; H. O. Bock, tires; operating manager, W. A. Mitchel.

The Pennsylvania Rubber Co., incorporated on May 25, 1899, is celebrating its fortieth anniversary. Its first manufacturing plant was in Erie, but in 1902 it was moved to Jeannette, Pa. Articles originally produced were solid tires, bicycle tires, and mechanical rubber goods. In 1906 an addition to the plant was erected, and the manufacture of automobile tires started. Tire production increased rapidly, and a few years later jar rings and mechanical rubber goods were dropped. Then in 1910 tennis ball production was started and today Pennsylvania is one of the largest producers of tennis balls in America. Since the first addition to the plant in 1906 it has been necessary to make further additions to take care of the increased demand for automobile tires, and the present floor space is approximately 395,000 square feet; the original at Jeannette was about 90,000 square feet.

Pennsylvania Rubber Co. operates on a national basis, maintaining a chain of twelve branches and one hundred warehouses or stocking points. More than 1,250 individuals are employed, many of whom have been with the company in excess of 20 years.

As a companion item to its tennis ball line Pennsylvania also merchandises golf balls and decorated play balls and a few years ago started the manufacture of shuttlecocks for badminton.

Baldwin-Southwark Corp., Philadelphia, Pa., has transferred R. G. Tabors from the main office to Chicago, where he will head the sales activities of the Southwark Division. A graduate of Case School of Applied Science, Mr. Tabors has been active in the development and sales of testing machines and hydraulic machinery manufactured by Baldwin-Southwark.

Garfield Electrical Supply Co., Inc., New York, N. Y., received recently a contract for $13,770 for insulated wire for the WPA.

Jerome T. ("Jerry") Shaw, for more than 19 years editor of *Tires*, 420 Lexington Ave., New York, N. Y., has also been made general manager of the magazine.

The Garlock Packing Co., Palmyra, N. Y., recently was awarded a contract to supply gaskets, to a value of $10,730.24, for the United States Navy Department.

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., in view of improved business, according to President George H. Bucher, on June 1 made full restoration of pay reductions for 8,700 salaried employes, who had received a 10% cut on June 1, 1938. Salaried employes earning under $125 monthly were restored to their full rates six months ago.

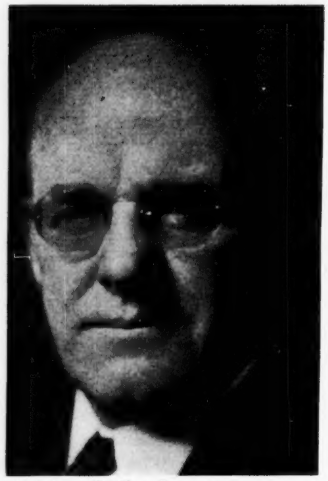
Manufacturing Chemists' Association of the United States, 608 Woodward Bldg., Washington, D. C., at its sixty-seventh annual meeting last month held election of officers. Lammot du Pont, president, E. I. du Pont de Nemours & Co., Inc., Wilmington, Del., was named president, and Charles Belknap, executive vice president, Monsanto Chemical Co., St. Louis, Mo., was elected a vice president of the association.

John A. Roebling's Sons Co., 107 Liberty St., New York, N. Y., last month won a contract to furnish the United States War Department with cable and reels, value $22,574.20.

Safety Director of U. S. Rubber

As supervisor of safety of the United States Rubber Co., 1790 Broadway, New York, N. Y., is a man whose training, experience, and personality well qualify him for this important work. Ernest W. Beck came to the company in June, 1920, as executive assistant to the president of the U. S. Tire Co., in charge of industrial relations and safety. After the personnel work of the concern was consolidated, however, he was made responsible for safety in all factories and allied interests.

He studied to become an instructor of manual training and mechanical drawing. He also took special courses



Blackstone Studios, Inc.

E. W. Beck

in engineering and insurance at Cornell, New York, and Columbia universities.

First, in 1906, he was assistant instructor in manual arts at Eliot School; then he taught in Boston, Cambridge, and Trenton, N. J. In 1910, Mr. Beck was chosen to organize and direct the manual arts department of the public schools in Nashua, N. H. Eight years later he was named principal of the New Hampshire school for training drafted men. Later, while associated with the United States Shipping Board, he was appointed director in charge of training shipyard workers to become instructors. On September 1, 1918, he joined The Groton Iron Works as manager of the employment and service departments, where he remained until he became associated with the rubber industry.

He is a prominent figure in the National Safety Council, particularly the Rubber Section, of which he was chairman (1922, 1925 to date); secretary of the National Rubber Machinery Code; member of the executive committee, N.S.C., (1924-32); vice president in charge of industrial safety, N.S.C., (1927-29); member at large (1932, 1938); director (1934-38); membership committee (1938). Mr. Beck was president of the American Society of Safety Engineers when it was merged with the Engineering Section of N.S.C. in 1924, and in 1926 he was elected chairman of this new group. He also belongs to the Greater New York Safety Council, Inc., and served as a member of the executive committee and chairman of the finance committee. Besides he is a member of the board of managers and of the executive committee of the Self-Insurers Association. Mr. Beck, moreover, has written several articles and made many addresses on the subject of safety. Despite all these activities he still finds time for his favorite sport—fishing.

Mr. Beck was married in 1914 and has two daughters. His home is in Leonia, N. J.

MIDWEST

THE trend of industrial production in the Midwest has been generally downward, with few indications of improving demand. Employment and payrolls thus registered declines. For the rubber industry 36 firms with 17,452 employes reported wages of $437,000, decreases of 5.6% and 11.8% respectively over the previous month, marking the sharpest drops among all industrial groups in the district.

Last month auto output fluctuated weekly, receding and gaining more than seasonally. Part of the decline was due, of course, to labor disputes. Sales have lagged so far this year, although May sales were gratifying, and inventories are quite heavy; much sales resistance is met with because of the approaching 1940 models. The situation may be further complicated if, as currently reported, manufacturers may introduce their new models to the midsummer crowds at the expositions in San Francisco and New York.

Skelly Oil Co., Kansas City, Mo., is celebrating its twentieth anniversary.

H. Freundlich, of the University of Minnesota, has been elected to foreign membership in the Royal Society (London).

Graduates' Outlook Good

According to a recent survey by Investors Syndicate of Minneapolis, approximately three-quarters of the June graduates from 193 American colleges, universities, and technical and normal schools are expected to be in permanent positions before the summer ends, the brightest job prospects in two years. Employers are demanding as job essentials: character, scholarship, personality, and adaptability. They are emphasizing to a less extent athletic prowess and campus popularity. Preference is indicated for the all-around student who works hard in and out of class—yet is not the college "grind"—for he or she will work hard after commencement.

Out of 25 types of industrial and commercial employment "rubber manufacturing" received the most frequent mention, thus indicating the active foresight of the rubber industry in building its organization for future expansion.

Lacquered Formula Cards

Formula cards used daily in the compound room often become dirty and illegible owing to their affinity for carbon black, pigments, and greasy thumbs. One alert foreman improved this situation by lacquering the cards when new and periodically wiping off the collected dirt with a damp cloth. *Du Pont News Letter*, April 28, 1939.

OHIO

A RECENT report indicates that the tire industry is having a relatively good year in its sales of replacement tires and a better one than last year for original equipment. It is expected that replacement sales will constitute about three-quarters of the 1939 total.

It is felt that the rubber industry as a whole will benefit materially under the bill appropriating $100,000,000 for purchases of war materials by the United States government during the years 1939 to 1943 to strengthen national defense. The bill, it is stated, also calls for installation of government-owned machinery in plants producing war products, which equipment, however, could not be used for goods to be placed on the commercial market. The government periodically would give contracts to those companies for production at maximum war-time speed.

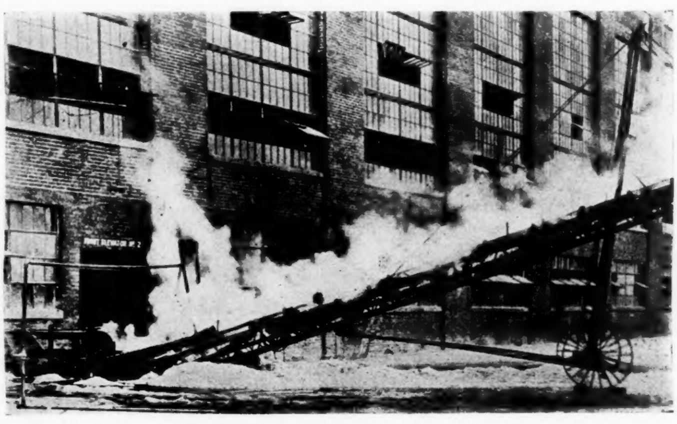
Goodrich Activities

Announcement was made on June 2, 1939, by The B. F. Goodrich Co., Akron, of a call for redemption on August 2, 1939, of its outstanding Fifteen Year 6% Convertible Gold Debentures, due June 1, 1945, at the redemption price of 103% of the principal amount together with accrued interest through The Chase National Bank of the City of New York, 11 Broad St., New York, N. Y.

The one millionth visitor to the Goodrich exhibit at the New York World's Fair, J. A. Dreher, of Birmingham, Ala., among other door prizes received a set of Silvertown Life-Saver tires.

Rubber Conveyer Belt Defies Heat

The 658-foot Goodrich Hot Material Belt was installed at a large western smelter in June, 1933, and has been in continuous service ever since, carrying hot lead ore from Dwight & Lloyd roasters at a temperature of approximately 200° F. After about 4½ years the belt, which has a ⅛-inch cover on both sides, was reversed, and the owners anticipate receiving from 2½ to 3 years' more service. The heat-resisting compound, used in the carcass of the belt, is said actually to improve in tensile strength and friction pull after exposure to heat. The best service obtained prior to this is reported to be a little over three years, even when both sides of the belt had been used in service.


Goodrich Belt Conveying Hot Ore

Miller Anniversary

The Miller Rubber Co., founded in 1894 by the late H. L. Miller and Jacob Pfeiffer, in the 45 years of its existence has expanded from a little one-story frame building in a pasture field to an imposing series of structures covering more than 90 acres of ground and providing more than 30 acres of floor space, with a world-known line of products including druggists' and surgeons' specialties, molded and dipped goods, accessories, and repair materials. The Miller and the Goodrich plants were merged in 1930.

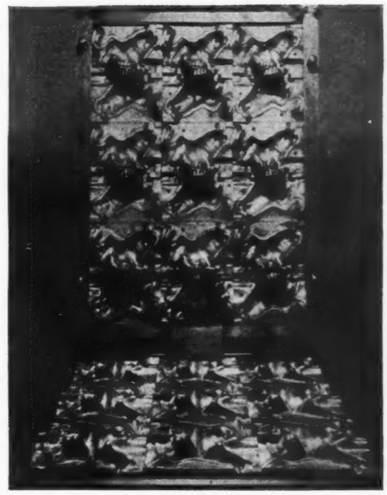
The late Mr. Miller was a brother of Lee R. Miller, also of the original factory personnel, who has for many years supervised production of Miller cement dipped gloves for surgeons and hospital use.

Oenslager Honored by Akron University

The honorary degree of doctor of science was conferred upon George Oenslager, dean of the rubber industry's research chemists, at the annual commencement exercises of Akron University. Dr. Hezzleton E. Simmons, university president, also a chemist, conferred the honor.

Dr. Oenslager, who also received the Perkin medal in 1933, is still active in the chemical research laboratories of The B. F. Goodrich Co., and has had a long and distinguished record in rubber chemical research. His greatest contribution was the discovery of organic accelerators in 1906. A graduate of Harvard, he started work in the rubber industry in 1905, one year before his revelations of the powerful factor organic accelerators were in rubber technology.

Akron University also presented honorary degrees of doctor of laws on Frank A. and Charles Seiberling. Honorary degrees had been presented to only seven others in the institution's history.


The Necessity of Attention to Details in Mold Layout and Construction for Producing Toys of Intricate Design Is Illustrated in the above Photograph of Molds Supplied by Ferriot Bros., Inc., and Used by Seiberling Latex Products Co. in the Production of Ferdinand the Bull, One of the Popular Disney Characters

Goodyear News

The Goodyear Tire & Rubber Co., Akron, has reopened on a permanent basis the World's Fair of Rubber exhibit that attracted so much attention during the recent Homecoming celebration at Goodyear Hall. With an attendant in charge the display is open from 9:00 to 5:00 daily except Saturday and Sunday. Plans are now under way to make the exhibit part of the factory trip taken by plant visitors and dealers as well as groups from schools and colleges.

Essay Contest Winners

The following boys studying vocational agriculture in high schools are the grand prize winners of the national essay contest sponsored by Goodyear on "Farming of Tomorrow on Rubber:" Harold Smith, Halfway, Ore.; Robert Ector, Wilmington, Del.; Paul Holley, Vanleer, Tenn.; Donald Sudman, St. Mary's O.; Dana Stewart, Princeville, Ill.; John Patricks, Roy, N. Mex.; Tony Erquiaga, Fallon, Nev.;

Charles Ecklund, Harveyville, Kans.; Dale Smith, Ventura, Calif., and Sam Chastain, Moores Hill, Ind. The grand prize for each will be a trip to Akron, Cleveland, Detroit, and Timagami, Ont., where the group will spend a week's North Woods outing as guests of P. W. Litchfield, Goodyear president. En-route back to the United States the boys will visit the home of the Dionne Quintuplets, Toronto, and Niagara Falls.

Halfway High School, attended by Harold Smith, whose manuscript was adjudged outstanding, will be awarded $100 in cash for an educational project in recognition of Smith's fine essay. Twenty-five other contestants will be awarded $25 each in cash.

Safety Award

In an effort to do its part in the national campaign for safer travel on highways, Goodyear, besides its industry contribution of improved tires and LifeGuards, offers a safety plaque as an award to the sales division with the fewest motor accidents.

Personnel Mention

George E. Price, Jr., of Goodyear, was elected a national vice president of the National Association of Purchasing Agents at its twenty-fourth annual international convention in San Francisco, Calif.

Ian D. Patterson, who had gone to Goodyear's English plant on November 1, 1927, as chief chemist and became development manager in 1936, on February 16 returned to the compounding division at the Akron plant. Mr. Patterson, a native of Michigan, obtained his A.B. degree from Albion in 1918, did post-graduate work at the University of Michigan, 1919-20, and joined Goodyear on September 21, 1921. He is the father of twin daughters.

Association of Crude Rubber Users

As outlined on page 61 of our June issue, a meeting was held on June 12 in Cleveland, to discuss the desirability of and to formulate plans for consolidated action by crude rubber consumers to promote increased growth of crude rubber in the western hemisphere. Attending the preliminary meeting, presided over by S. N. Clarkson, were: R. M. Graham, General Tire & Rubber Co., Akron; W. J. Bechtold and J. R. Keach, Ohio Rubber Co., Willoughby, O.; J. M. Slattery, Fisk Rubber Corp., Chicopee Falls, Mass.; W. H. Spencer, Alliance Rubber Co., Alliance, O.; J. A. Kopeske, Rubberset Co., Newark, N. J.; W. G. Lerch, Cascade Rubber, Inc., Cuyahoga Falls, O.; W. B. McIntosh, Pyramid Rubber Co., Ravenna, O.; C. E. Reiss, R-C-A Rubber Co., Akron; H. W. Osborn, Stalwart Rubber Co., Bedford, O.; J. W. Vander Laan, district manager, U. S. Bureau of Foreign & Domestic Commerce, Cleveland; K. L. Milligan, Pioneer Rubber Co., Willard, O.

Mr. Clarkson reported that about 100 companies, including practically all of the large users, had indicated in replies to his questionnaire letter that they were interested in the consummation of such a program. Out of the general discussion agreement was reached to the effect that: the support of a great preponderance of both large and small users of crude rubber in this country is necessary to secure from Congress the proper appropriations to enable the Department of Agriculture to extend its efforts to develop a disease-proof tree, the leaf disease being the chief deterrent to the growth of rubber in South America.

Resolutions were passed to the effect that: (1) the proposed organization of the American Crude Rubber Association be held in abeyance for some three months and that the R.M.A. be invited to try to get the support of a preponderance of non-member consumers; (2) if the R.M.A. is successful, the present movement could be merged with the R.M.A. under some identifying name or division; and (3) if the R.M.A. is unsuccessful within this period, the R.M.A. and its members agree to refrain from any such activity and to reciprocate the cooperation shown by the sponsors of this movement.

To advise Mr. Clarkson on future action the following committee was selected from those present: J. M. Slattery, chairman, J. R. Keach, C. E. Reiss, W. H. Spencer, and R. M. Graham. The meeting was adjourned subject to the call of the chairman.

V. L. Smithers, head of a consulting laboratory in Akron, has been named commissioner of the National Battery Manufacturers Association, succeeding W. J. Parker, resigned.

The Firestone Tire & Rubber Co., Akron, employes' excursion to the New York World's Fair will take place July 1, 2, and 3.

Mrs. C. E. Ely, of Hampton, N. J., the one-millionth visitor to the Firestone exhibit at the fair, received a certificate entitling her to a set of tires.

Clinton Doede has resigned as head of the physical chemistry division of Firestone's research laboratory to become chief chemist of the Connecticut Hard Rubber Co., New Haven, Conn., where he plans to do much experimental work on latex and synthetic rubber products.

NEW JERSEY

RUBBER manufacturers in the Trenton district are encouraged over the noted improvement in business conditions. While the rise is slow, manufacturers believe it is an indication that the demand for various mechanical goods will continue to gain. An increase is also noted in the production of heels and soles; while the hard rubber situation remains the same.

Jos. Stokes Rubber Co., Trenton, reports that business is beginning to improve. The company's Canadian plant at Welland, Ont., has been busy for the past several months.

Crescent Insulated Wire & Cable Co., Trenton, experienced a better volume of business. Officials believe that increased business may cause a rise in prices of finished products. Joseph P. Clark, of the Crescent company, has been elected chairman of juniors of the American Society of Mechanical Engineers, Philadelphia Section, for the 1939-40 year. Mr. Clark is also evening instructor in machine shop practice and welding at the Trenton School of Industrial Arts.

Pocono Co., Trenton, finds business has improved considerably during the past few weeks, with a better showing than in the same period last year.

The Thermoid Co., Trenton, has announced three additions to its Thermoid Rubber division. Newell A. Perry, Jr., a Harvard graduate with eight years' experience in the laboratory and production end of the mechanical rubber goods business, has joined the laboratory staff as a research chemist, specializing in compounds and testing methods. Charles Mudd, a Columbia graduate with several years experience in the mechanical rubber goods industry, has also been added to the laboratory staff to work on compounding and chemical research. James E. Harrah, with 14 years' experience in the manufacture of molded and wrapped hose, has been placed in charge of the molded hose department.

Pierce-Roberts Rubber Co., Trenton, finds business is picking up with a better demand for radio supplies and other mechanical goods.

(Continued on page 59)

Plant of Martindell Molding Co., Inc., Ewing Township, N. J.

NEW ENGLAND

Fred Toomey, Jr., of Chicopee Falls, Mass., (Seen Here with Frank Buck at the New York World's Fair) Has Been Selected by the Fisk Tire Co. as the Model for Recreating Its Famous "Time-to-Retire" Boy

Fisk Reports

Eighty-nine per cent of 600 representative Fisk tire dealers interviewed in a national survey by the Fisk Rubber Corp., Chicopee Falls, Mass., expect a definite improvement in business this year over last, according to Advertising Manager H. R. Hurd. Expected increases, the survey showed, ranged from 10 to 100% over 1938 sales. One dealer reported he would sell at least $100,000 more Fisk tires this year. The survey also revealed, Mr. Hurd said, that safety advertising by tire manufacturers is definitely creating a demand for higher priced tires.

In general, the dealers reported, persons with cars less than four years old will buy first-line tires. Persons with cars older than four years usually buy second- and third-line tires, and in some cases, retreads.

Vacation Figures

The world's peak in passenger motor travel will reach 260 billion miles in 1939, Col. Charles E. Speaks, Fisk president, predicted as the summer touring season got under way.

Vacation expenditures will also reach a new high mark, he pointed out, probably about $5,000,000,000, an increase of $750,000,000 over 1938. About 61¢ of every dollar will go for transportation, room accommodations, and meals. The remainder will be divided among amusement, refreshment, and retail purchases, Colonel Speaks said.

Safety Suggestion

John E. Lynch, Fisk safety director, recently recommended enactment by all state legislatures of a law to enforce a minimum speed limit of 30 miles an hour on all main highways, as a vital factor in reducing automobile accidents. Such a speed limit would be low enough to satisfy the slow driver without penalizing the faster one. Mr. Lynch further suggested that sightseers use back roads that offer less of a traffic problem and better scenery.

Position of Replacement Tires

The question of choosing correct positions for new tires was answered by A. E. Benson, product development manager at Fisk, who advised always placing a new tire on the right front, a second new one on the right rear, and a third on the left front, for the right front is subject to abuse from striking the curb, riding rough road shoulders, and picking up foreign objects when the car leaves the road. The right rear also suffers from curb banging and hard work because it is a tractive tire. For safety's sake the front tires should be particularly good. Blow-outs in any tire are dangerous, but more so with front tires.

Herculean Work of Tires

A tire is one of the hardest worked units on an automobile. Thus work done in the lifetime of a 6.00 by 16 tire would be equivalent to the energy expended if a man pushed a one-pound weight two billion feet, or 15 times around the world, according to Fisk engineers. This same tire carries at all times a load approximately 45 times its own weight. To duplicate this feat an average man would have to carry a three-ton load on his back for two years.

In addition the tire must withstand the continuous flexing action of about 15,000,000 revolutions in a life span of 20,000 miles, plus the forces of starting and stopping.

Besides this normal work the tire may be abused more than any other part of the car. Designed for smooth rolling, it is driven over rocks and road holes, banged into curbs. On curves at high speeds it must often carry the weight of the entire car on two wheels and partly on the side of the tire instead of the flat tread.

These points emphasize the importance of correct air pressure to provide the tire with the strength to do its work. Underinflation induces excessive strain on all parts of the tire with the car weight transmitted to the cord carcass, and this causes extreme bending and flexing of the sidewalls. The tube may be pinched, and flats and blowouts result.

The Stanley Chemical Co., East Berlin, Conn., has announced that I. T. Darlington, a well-known authority in the field of industrial coatings, recently joined its research and development staff which is under the direction of E. M. Hayden, technical director. Mr. Darlington is a graduate of Lafayette College and did post graduate work at Columbia University. His chemical experience has always been in the field of organic chemistry. Following the war he was closely associated with the development of lacquers and lacquer materials with laboratory and technical experience in the manufacture of nitrocellulose and solvents. During the past 18 years Mr. Darlington has served in various capacities with some of the largest manufacturers of industrial coatings. He has had direct charge of production and for several years served as chief chemist in one of these plants. He was closely associated with the development of automotive finishes and the present-day synthetic finishes. Mr. Darlington's knowledge and experience will be devoted to the study of definite problems and the development of new materials to meet the ever-increasing demand for highly specialized products. Mr. Darlington, who will also devote his attention to sales service work, will be directly available to the company's customers in an advisory capacity.

Farrel-Birmingham News

Farrel-Birmingham Co., Inc., Ansonia, Conn., on May 13 held "Open House" when about 6,000 visitors, including friends and families of the employes and the general public, saw the inside of the plant, its facilities, and the equipment used to manufacture the castings, rolls, and heavy machinery which are the products of the plant. Part of the program covered a hobby show, totaling 56 entries of hobbies of all kinds. Besides there were also exhibits of every-day goods made on Farrel-Birmingham machinery and a special exhibit of the shop safety committee and the first-aid classes. The company also maintains a course of apprenticeship training, and these apprentices had a hobby show of their own. The Open House program was managed entirely by the employes through employe committees of their own choosing, and employes served as guides for the visitors. The management acted in an advisory capacity only and arranged for certain facilities at the disposal of the company.

The third annual service banquet of Farrel-Birmingham was held June 6 at Ansonia, with 130 men with the company over 25 years as guests of honor. Edwin Van Riper was presented with a diamond-studded watch charm in recognition of his completion of 60 years of service. He was also presented with a gold watch commemorating 50 years' service to take the place of the one awarded to him ten years ago, which was stolen. A 50-year watch was also given James Dunn; while John Walter received a 25-year service pin. There

are 142 employes of Farrel-Birmingham who have been awarded service pins. Of these 62 have been with the company from 25 to 29 years; 31 from 30 to 34 years; 16 from 35 to 39 years; 18 from 40 to 44 years; six from 45 to 49 years; and nine for 50 years or longer. At the head table were Franklin Farrel, Jr., chairman of the board, who presented the awards; Nelson W. Pickering, president, who acted as toastmaster; Igor Sikorsky, of Vought-Sikorsky Aircraft Co., who was the principal speaker; and Farrel employes with over a half century of service.

Globe Rubber Works, Inc., 45 High St., Boston, Mass., at a dinner on June 2 at Hotel Myles Standish, attended by about 30 guests, including employes and their families, celebrated the silver jubilee with the firm of President Arthur I. Knowles. After dinner all adjourned to the home of Dr. W. T. Knowles, vice president of the concern, where entertainment and games were enjoyed. President Knowles was given an onyx desk-pen set, and the presentation was made by I. L. Crandall, assistant treasurer, who has been associated with Mr. Knowles and his father, the late W. S. Knowles, for 33 years. Mr. Knowles received many other gifts from business associates. Next year the company will celebrate its fiftieth anniversary.

Protection for Latex Equipment

Dipping tanks and other equipment used in ammoniacal latex processes are protected against corrosion by Alkalon, a new coating material. Clear and amber-colored, the paint forms a hard film, resistant to alkalis, acid, oil, brine, moisture, alcohol, and heat. Alkalon is applied by brushing over a clean surface and may be thinned with xylol. A gallon covers 400 to 500 square feet, depending upon surface conditions.

FINANCIAL

Unless otherwise stated, the results of operations of the following companies are after deductions for operating expenses, normal federal income taxes, depreciation, and other charges, but before provision for federal surtax on undistributed earnings. Most of the figures are subject to final adjustments.

Dominion Textile Co., Ltd., Montreal, P. Q., Canada. Year ended March 31: net profit, $1,036,981, after provision for depreciation, directors' fees, legal fees, and income tax, equal to $3.27 a common share, against $1,459,026, or $4.84 a common share, in the preceding fiscal year.

Firestone Tire & Rubber Co., Akron, O. Six months ended April 30: net profit, $2,851,538, after deducting depreciation, interest, and federal taxes and, after providing for dividends on the 6% cumulative preferred stock, Series A, equivalent to 75¢ a share on the 1,936,458 outstanding shares of common stock, against a net profit of $2,429,738, or 53¢ a share on 1,941,303 shares of common stock, for the similar period one year ago.

Lee Rubber & Tire Corp., Conshohocken, Pa. Six months to April 30: consolidated net profit, $652,972, equal to $2.55 each on 255,565 shares of capital stock, against $314,105, or $1.23 a share, for the six months to April 30, 1938.

Mansfield Tire & Rubber Co., Mansfield, O. March quarter: net earnings, $178,265, equal after preferred dividends to $1.17 each on 152,202 common shares outstanding on completion of initial public financing announced recently.

Norwalk Tire & Rubber Co., Norwalk, Conn. Six months to March 31: net profit before federal income tax, $104,582, against $39,217 for six months to March 31, 1938.

Rome Cable Corp., Rome, N. Y. Year ended March 31: net income $213,960, equal to $1.12 each on 189,830 shares of common capital stock outstanding, against $71,027, or 37¢ a share, in the preceding fiscal year; current assets, $1,564,410, current liabilities $503,019, compared with $1,128,082 and $315,688 respectively on March 31, 1938.

Seiberling Rubber Co., Akron, O. Six months ended April 30: net income before taxes, $403,576, against a loss of $44,955 in the six months ended on April 30, 1938. Total current assets on April 30, 1939, were $3,177,170, and current liabilities $1,649,224. Consolidated net sales rose 27% to $4,400,593 in the six months ended on April 30, from $3,444,870 in the same period of the previous fiscal year, J. P. Seiberling, president, told stockholders at a special meeting on June 1 which approved the capital readjustment plan.

Mr. Seiberling said the company would register shortly a new issue of 34,000 shares of convertible prior preference stock to be underwritten by a New York banking group. This will be the company's senior security, and the stock will be cumulative as to dividends of $2.50 a share. By action of the preferred and common stockholders, the old 8% preferred stock is now reclassified into $100 par value 5% Class A cumulative preferred and $100 par value 5% Class B non-cumulative preferred. Dividends will be payable on the prior preference stock from date of issuance. Dividends on the 5% Class A preferred issued before October 1, 1939, will be payable from October 1, 1938.

A. G. Spalding & Bros., 105 Nassau St., New York, N. Y. Quarter to April 30: profit before income taxes, $206,263, against a loss of $108,284 in the preceding quarter and $128,648 loss in the April, 1938, quarter. Six months to April 30: net profit, $77,979, after deducting income taxes of $20,000, equal to $2.35 each on 33,112 shares of 7% cumulative first preferred stock of $100 par, on which are back dividends. In the corresponding six months of the previous year was a net loss of $416,121. Net sales for the quarter ended with April, 1939, totaled $3,289,898, against $3,387,400 in the same period last year.

S. S. White Dental Mfg. Co., Philadelphia, Pa., and subsidiaries. Quarter to March 31: net profit, $39,898, equal to 13¢ each on 300,000 shares of common stock, against net profit of $10,315, or 3¢ a share in the March quarter of 1938. Sales for the first quarter of this year totaled $2,048,274, against sales of $1,999,121 in the same period last year.

Dividends Declared

Company	Stock	Rate	Payable	Stock of Record
American Hard Rubber Co.	Pfd.	$2.00 q.	June 30	June 15
Armstrong Rubber Co.	A & B	$1.00	June 26	June 15
Baldwin Rubber Co.	Com.	$0.12½ resumed	July 20	July 15
Baldwin Rubber Co.	Com.	$0.12½	Sept. 20	Sept. 15
Detroit Gasket & Mfg. Co.	Com.	$0.25	July 20	July 5
Dunlop Tire & Rubber Goods Co., Ltd.	5% 1st Pfd.	$0.62½ s.	June 30	June 20
Firestone Tire & Rubber Co.	Com.	$0.25	July 20	July 5
Garlock Packing Co.	Com.	$0.50	June 30	June 24
General Tire & Rubber Co.	Pfd.	$1.50 q.	June 30	June 20
B. F. Goodrich Co.	$5 Cum. Pfd.	$1.25 q.	June 30	June 23
Goodyear Tire & Rubber Co.	Com.	$0.25	Sept. 15	Aug. 15
Goodyear Tire & Rubber Co.	$5 Pfd.	$1.25	Sept. 15	Aug. 15
Goodyear Tire & Rubber Co. of Canada, Ltd.	Com.	$0.63 q.	July 3	June 15
Hercules Powder Co.	Com.	$0.40	June 24	June 13
Jenkins Bros.	Non-voting	$0.12½ irreg.	June 29	June 15
Jenkins Bros.	Founders Share	$0.50 irreg.	June 29	June 15
Jenkins Bros.	7% Pfd.	$1.75 q.	June 29	June 15
Mansfield Tire & Rubber Co.	Com.	$0.10 extra	June 20	June 10
Mansfield Tire & Rubber Co.	Com.	$0.25 q.	June 20	June 10
Midwest Rubber Reclaiming Co.	$4 Pfd.	$1.00 q.	June 1	May 20
Midwest Rubber Reclaiming Co.	Com.	$0.25	Aug. 1	July 20
Midwest Rubber Reclaiming Co.	Pfd.	$1.00 q.	Sept. 1	Aug. 19
Plymouth Rubber Co., Inc.	7% Pfd.	$1.75 q.	July 15	July 1
Seiberling Rubber Co.	Class A 5% Pfd. (new)	$1.25 q.	June 26	June 20

NEW JERSEY

(Continued from page 56)

William H. Sayen, president, Mercer Rubber Co., Hamilton Square, recently returned from a trip through the Midwest, finds a better business trend.

United Rubber Workers of America, Local Union No. 107, of Trenton, has petitioned Congress to amend the Sherman anti-trust act so that it may not be applied to trade unions. The local sent a copy of a resolution citing a verdict for damages against a hosiery union in connection with a strike at a Philadelphia mill.

Essex Rubber Co., Trenton, sees better demand for all its goods. Officials who attended the New England shoe convention report better orders.

Rubber Manufacturers Association, Inc., 444 Madison Ave., New York, N. Y. Thirty members of its heavy mechanical goods sub-division recently held a two-day session at the Trenton Country Club, Trenton. Following dinner golf was indulged in. A. D. Kunze, of New York, presided at the business meetings. A. Boyd Cornell, of the Hamilton Rubber Mfg. Co., Trenton, was chairman of the committee on arrangements.

The Okonite Co., Passaic, recently received a contract to supply cable ($10,008) for the United States Navy.

National Rubber Machinery Co., Clifton Division, Clifton, N. J., held a shop picnic on June 10 at Suntan Lake attended by practically the entire shop personnel comprising both shifts with their families. Various games were played including a baseball game and a horseshoe pitching contest in which the team of Plant Manager R. W. Grant and Exercycle Foreman Edward Ulinsky met all comers, with the winning combination consisting of Plant Superintendent Sam DeGhetto and Assistant Superintendent Leonard Lederer. Swimming and children's games were enjoyed by the younger groups.

CHILE

A new rubber company was formed at Quilpue, about 10 miles from Valparaiso, last year by Italians or Chileans of Italian origin. The concern, known as Industrias de la Goma, Chiappe-Schiaffini S.A., has a capital of 1,700,000 pesos ($68,000), which may shortly be raised to 3,000,000 pesos ($120,000). The factory employing about 50, is equipped with German machinery, and an expert, trained in Italy and formerly with Pirelli, has been engaged. Output will include the smaller mechanical goods, toys, hot water bottles, ice bags, fabrics, heels and soles, bicycle tubes, rubber for retreading, etc.

OBITUARY

Harry A. Larson

A HEART attack while he was playing golf on June 16 caused the death of Harry Allen Larson, since 1929 technical superintendent of the Electric Hose & Rubber Co., Wilmington, Del., which he had joined in 1917 as a chemist, becoming assistant superintendent in 1925. His previous connection had been with the Mechanical Rubber Co., Cleveland, O. Born in Canada, August 4, 1889, he attended McMasters University and Massachusetts Institute of Technology. During the World War, Mr. Larson served with the United States Army. He was also a member of the Newark (Del.) Country Club.

Surviving are his wife, a daughter, and a son.

The funeral took place on June 19, with burial in Newark.

J. N. Burger

J. N. BURGER, 71, a director of the Sumatra Rubber Cultuur Mij. Serbadjadi, of the International Association for Rubber Cultivation in Netherland India, and of various other companies and a founder and for many years president of the Netherlands Rubber Trade Association, died in Holland on May 29. The government recognized his many services on behalf of the rubber industry by appointing him an Officer in the Orange Nassau Order in 1923. On the twenty-fifth anniversary of the Netherlands Rubber Trade Association he was created a knight of the Order of the Netherlands Lion.

Stiffening Agent

(Continued from page 50)

contains approximately 90% silicon dioxide. When used in crepe rubber, it produces a stiffening effect, the product becoming stiffer and more inelastic as the proportion of Santocel is increased. For this purpose usually two to 10% of Santocel is used. A high-grade white stock suitable for white sidewalls utilizes 20% of micronized Santocel; the vulcanized compound shows a tensile strength of over 4,200 pounds per square inch at break.

COLOMBIA

The Cia. Croydon de Pacifico S.A. was formed in Cali, to manufacture toys, heels, shoe linings, raincoats, etc., from locally produced rubber. Capital is said to be Swiss, amounting to about 250,000 pesos. Except for German spreaders, American machinery will be used.

MEXICO

The chief development of the Mexican rubber industry has taken place in the last decade. In 1929 the industry employed 450 persons and produced goods to a value of about 2,100,000 pesos. By 1937 the number of workers was 1,338, and the value of the output, mainly tires and tubes, was 18,800,000 pesos. Production of automobile tires rose from 11,834 units, value 600,000 pesos, in 1929, to about 206,000 units, value 13,900,000 pesos, in 1937; inner tubes rose from 9,229 units, value 46,000 pesos, in 1929 to 156,000 units, value 1,500,000 pesos, in 1937. Manufactures in 1937 also included 11,500,000 pairs of rubber footwear, besides waterproof clothing, hose, balls, toys, etc.

The imports of crude rubber in 1937 were 4,239,627 kilos in addition to 135,189 kilos latex; in 1938 a sharp decline occurred, to 1,840,724 kilos crude rubber and 23,725 kilos latex.

The increased home production has resulted in a corresponding decrease in imports of rubber goods, from 2,400 tons, value 2,500,000 pesos, in 1929, to 300 tons, value 300,000 pesos, in 1937.

ARGENTINA

Argentina's imports of rubber goods in 1938 included 228,346 kilos hose, against 316,667 kilos in 1937; sheets for soles, 41,978 kilos, against 28,699 kilos; erasers, 13,241, against 14,855 kilos; pneumatic tires for automobiles, 488,419 against 592,804 kilos; tubes for automobile tires, 28,802 against 22,316 kilos; solid tires for carriages, etc., 158,008 against 145,774 kilos; rubber thread, 71,693, against 123,870 kilos; rubber sheets with fabric or metal, 127,327 against 167,010 kilos; rubber sheets, valves, belts, etc., 83,474, against 58,004 kilos.

On the whole there was a reduction in imports due partly to increased local production of some goods and partly to exchange control restrictions.

Argentina is now in a position to make almost any kind of transmission or conveyer belting up to 48 inches wide. The various manufacturing firms established here also produce a wide variety of other goods, the largest general factory being that of Pirelli which makes canvas rubber-soled footwear, heels, molded goods, bath mats, matting, automobile floor mats, and a full line of hose. India Rubber, Gutta Percha & Telegraph Works Co., Ltd., and Atilo Colautto also make a full line of hose. Molded garden hose is manufactured by one American plant. High pressure oil, linen, and fire hose must still be imported.

Practically the entire demand for canvas rubber-soled footwear is covered by local production. Argentina also manufactures six to seven million pairs of rubber heels per annum.

Rubber Industry in Europe

GREAT BRITAIN

I.R.I. Meeting

At the annual general meeting of the Institution of the Rubber Industry on May 17, Lieut.-Col. Sir Walrond Sinclair, K.B.E., was elected president for the ensuing year. The following vice presidents were also elected: F. D. Ascoli, Sir George Beharrell, D.S.O., Col. J. Sealy Clarke, Hugh C. Coles, Lord Colwyn, Alexander Johnston, Eric Macfadyen, H. Eric Miller, H. G. Montgomery, R. C. Morris, Dr. S. S. Pickles, B. D. Porritt, Herbert Rogers, S. T. Rowe (retiring president), Dr. P. Schidrowitz, T. G. Spencer, Dr. F. R. Twiss, and D. F. L. Zorn. Dinner followed the meeting; the guests included W. T. Hunter of the U.S.A.

The first speaker, Sir George Beharrell (past president), said the Institution had done a great deal to stimulate education, but that much more could be done. He expressed the hope that before long a part of a considerable sum of money now available for research would be spent in encouraging the youth of the industry by scholarships, bursaries, etc. Turning to research and development, he said that the latex side of the industry, still in its infancy, offered one of the greatest possibilities. He believed that the rubber growing and regulation scheme had been very fairly administered, but that the salvation of the industry would not come from steadily contracting output with a desire to raise prices, but from steady development of uses resulting in a rising percentage of export quota and consequent reduction in costs.

The new president said that he would like to see the Institution enrollment of 1,427 reach at least 2,000 in his term of office and appealed to all members for active support, which was necessary to help carry out the new program of advancement that the Institution had mapped out and by which it would be enabled to submit hopefully a second petition for a Royal Charter. The first petition, made about two years ago, was unsuccessful.

New Propaganda Method

As an aid to increasing the home demand for rubber goods the British Rubber Publicity Association is arranging special rubber exhibitions in leading department stores. The first was held at Bentalls, Kingston-on-Thames, from April 29 to May 13. Augmenting a display of rubber goods for the home, sports, games, clothing, child care, etc., three times daily mannequins displayed foundation garments, rain-wear, beach wear, and footwear, the special features of which were pointed out by a commentator. Latex dipping was demonstrated, and films on the cultivation and preparation of raw rubber and the manufacture of various rubber goods were shown.

Notes

The Research Association of British Rubber Manufacturers is to have a new laboratory at Leatherhead, Surrey.

James Fairbairn, formerly chairman of the Rubber Growers Association and for the last nine years chairman of the Propaganda Committee of the Association, has retired from the latter position.

The footwear division of Dunlop Rubber Co., Ltd., is offering £425 in prizes in a window dressing competition in which Dunlop summer footwear must be displayed.

George Spencer Moulton & Co., reported profits of £62,561 for 1938 against £60,474 in 1937. It is proposed to pay 5% on the ordinary shares as in the preceding year when the company resumed distribution of dividends after a six-year interval.

SWEDEN

The Goodyear Gummi A/B of Sweden, which recently decided to produce automobile tires, has increased its capital from 750,000 kroner to 6,500,000 kroner, by issuing 11,500 shares. These new shares, it is understood, will all be taken up by the Goodyear Tire & Rubber Co., Akron, O., U. S. A.

Skandinaviska Gummi A/B, Sweden, it is said, has requested permission of the government to manufacture gas masks.

FRANCE

To develop the use of rubber on farms, particularly in the form of tires, the Propaganda Center of the French Rubber Institute has formed a special committee for adapting farm vehicles for running on pneumatic tires. This committee will study types of vehicles which will answer agricultural and military needs at the same time. The Propaganda Center has been sending to the chief agricultural fairs a traveling exhibition showing different kinds of tires and other rubber articles for use on farms as well as a diorama illustrating some of these uses.

GERMANY

Dekorit F.

A new casting resin being marketed under the name of Dekorit F. has been perfected by the Chemische Fabrik Dr. F. Raschig, G.m.b.H., Ludwigshafen a.Rh. The product is a phenol resin made according to a special condensation process, without filler. Steel gray to black in color, it is very hard, has high heat resistance, shows comparatively little tendency to shrinkage; has high resistance to water, steam, and a wide variety of chemical agents; and is non-inflammable and incombustible. It is fairly brittle, which characteristic limits its uses, but this brittleness is not more pronounced than that of other phenolic resins not reenforced with fibrous fillers. Among other applications, it is reported to be suitable for replacing hard rubber for the manufacture of rolls, forms, vessels, etc. A special adhesive has also been developed with which Dekorit F. parts can be very firmly cemented together. The joints have the same chemical resistance and mechanical properties as the parts themselves.

Imports and Exports

Germany's net imports of crude rubber during the first quarter of 1939 totaled 331,984 quintals, against 244,617 quintals in the same period of 1938.

Imports of rubber manufactures increased to 5,322 quintals, value 1,293,000 marks, against 4,357 quintals, value 1,172,000 marks. At the same time exports were 47,570 quintals, value 11,452,000 marks, against 40,862 quintals, value 10,611,000 marks.

Scientific Groups

The Berlin Group, Deutsche Kautschuk Gesellschaft, met May 26, when Dr. P. Stoecklin, of the rubber division, I. G. Farbenindustrie, Leverkusen, spoke on the "Exchange of Experiences in Working up Buna."

The Dechema, German Chemical Engineering Society, has moved its offices (Dechema- Achema- and Standard-Office) from Berlin to Frankfurt a.M., Dechema-Haus, Bismarckallee, 25. A branch office will remain in Berlin, at Haus des Vereins Deutscher Chemiker, Potsdamer Strasse 11, Berlin W. 35.

Company News

The I. G. Farbenfabriken reported net profits of 55,180,000 marks for 1938, against 54,853,329 marks in 1937. However, last year 135,718,000 marks were

written off for plant against only 105,-250,296 marks in the preceding year. It is proposed to turn out an 8% dividend again.

The Harburger Gummiwaren-Fabrik Phoenix A.G., Hamburg-Harburg, reported net profits of 410,061 marks, which with the carry-forward from the preceding year, totaled 640,934 marks. A dividend of 10% was proposed. The company spent a considerable sum in expansions last year and also in improvements, necessitated chiefly by the increasing use of synthetic materials in the production of rubber goods. Further large expenditures along these lines are in prospect for the coming year. The financial condition of the concern is favorable, but it asked and received permission from the government to increase its capital, raising it by 1,620,000 marks to 4,860,000 marks.

The Deutsche Kabel A.G., Berlin, reported increased business both at home and abroad in spite of difficulties. The associated firms also report satisfactory development; the Deka Pneumatik G.m.b.H., is working to capacity in its Berlin establishment, and the special tire factory being constructed in Ketschendorf is expected to be ready before the year-end of the current year. Deutsche Kabel has applied to the government for permission to increase its present capital by 2,840,000 marks, to bring it to 8,000,000 marks.

U. S. S. R.

A perfect substitute for cement made from smoked sheet rubber is claimed to have been produced at the Kauchuk factory from *kok-saghiz*, a rubber-bearing plant being cultivated in Russia. At the Treugolnik laboratory successful attempts are also said to have been made in the production of cut thread from Soviet rubbers. Sovprene, the Russian synthetic rubber similar to Neoprene, and rubber from *tau-saghiz* and *kok-saghiz* are said to have given satisfactory results; the thread obtained from mixes based on these rubbers show properties which on the whole equalled those of thread made from imported rubber.

BELGIUM

Englebert Fils & Cie., Liege, Belgium, reported that it suffered much in the past business year as a result of the prevailing international economic and political situation. Business in cycle tires was especially affected by the adverse conditions. Much research work has been done on the production of truck tires with metallic fabric and artificial silk. The German branch in Aachen is using much synthetic rubber and artificial silk, and the tires pro-

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Far East

MALAYA

Preparing Estate Rubber

Estate rubber is still prepared with an eye mainly to appearances, while the question of variability is ignored, wrote a special correspondent to the *Straits Times*: "It is becoming increasingly evident that the rubber-growing industry is greatly prejudicing its own interests by not voluntarily anticipating the demands made by the manufacturers of rubber articles for a thorough revision of estate manufacturing methods of crude rubber. The rubber growers should make it their sole aim and object to put at the disposal of the manufacturers estate factory products of chemical purity and unvarying intrinsic properties."

If rubber growers succeeded in revolutionizing present marketing standards so that the only criterion of rubber's true value would be its guaranteed suitability for special purposes, he continued, the greatest handicap in the coming struggle for existence against synthetic products would be eliminated.

The present estate factory product, he said, retains a large part of the serum proteins natural to unrefined latex, which largely, if not entirely, appears responsible for the variability. He suggested repeated creaming of the latex as a remedy, the additional cost being compensated for by a saving in testing, blending, etc., and the present risk of failure.

Best Clones of Today

According to the *Planters' Bulletin*, a new periodical issued by the Rubber Research Institute of Malaya, the ten best clones for planting in Malaya are: Tjirandji 1, Tjirandji 16, Prang Besar 25, Prang Besar 86, Pilmoor, Glenshiel 1, Pilmoor D 65, Lunderston N, Prang Besar 186, and Avros 49.

Hundreds of clones have been developed, but only a few have come up to standard and have combined high yield capacity with comparative freedom from serious secondary defects such as susceptibility to disease and mechanical injury, poor bark renewal, etc. Even the above carefully selected clones have their drawbacks so that great care must be exercised to see that soil conditions are suitable. Practically all high-yielding clones also suffer more or less from Brown Bast, and suitable tapping systems are needed to insure that the incidence of the disease is reduced to a minimum.

The Planting Correspondent of the *Straits Times* stated that notes made by a well-known visiting agent and director while recently touring large areas of budded rubber in Java and Sumatra revealed that the chief diseases of the tapping panel there were moldy rot, stripe canker, burrs and nodules and bark bursts forming pads of rubber under the bark. The director further observed that while seedlings were not immune from these troubles, the percentage was much less than for buddings.

NEW ZEALAND

Latex Products, Ltd., New Zealand, affiliated with Dunlop Perdriau, Ltd., Australia, erecting a factory at Woolston to make tennis and sports shoes, expects to start production in July at the rate of 750,000 pairs annually. The New Zealand Government recently introduced measures restricting imports and thus expects to encourage new enterprises.

INDO-CHINA

During March Indo-China exported 3,994 metric tons of crude rubber, against 5,783 tons in February. Exports for the first quarter of 1939 totaled 14,625 metric tons. Exports for year 1938 were 60,080 metric tons.

It is estimated that during the five years of the current restriction period exports from Indo-China will be as follows: 63,918 tons in 1939; 69,949 tons in 1940; 75,678 tons in 1941; 80,703 tons in 1942; and 85,011 tons in 1943. Under the provisions of the regulation scheme, exports from Indo-China up to 60,000 tons annually, are exempt from restriction.

NETHERLAND INDIA

Central Bureau of Statistics reported 28,455,805 kilos of rubber were exported from Netherland India in March, 1939. Of this 5,522,490 kilos came from estates in Java and included 75,439 kilos in the form of manufactures and 7,331 kilos of latex. Estates in the Outer Provinces shipped 8,153,505 kilos of rubber including 1,024,871 kilos of latex; natives in the Outer Provinces exported 14,779,810 kilos of rubber.

Rubber estates import from Europe a large number of cups, pails, and other containers for holding latex collected after tapping the trees. But a Javanese, R. Soediono, has started the Bagelen Tin & Zinc Industry in Keboemen, employing 25 persons, to manufacture these goods. Although the venture was begun only recently, the products are said to be finding an increasing sale in Central Java, and the little concern counts several large estates and also some government undertakings among its customers.

Editor's Book Table

NEW PUBLICATIONS

"News about du Pont Rubber Chemicals." E. I. du Pont de Nemours & Co., Inc., Wilmington, Del. Included with this news letter dated May 26 is a 20-page report, No. 39-3, entitled, "Neoprene Latex Type 57," by B. Dales and W. H. Ayscue.

"Tire Retreading Equipment by Shaw." Francis Shaw & Co., Ltd., Corbett St., Manchester, 11, England. 8 pages. This illustrated leaflet, covering the firm's line of retreading equipment, briefly describes the following: machine with adjustable jaws for examining tires; buffing apparatus; detreader; pressure stitcher; tread applying stand with expanding chuck; vulcanizing molds; gas-fired steam boiler with a working pressure of 100 pounds per square inch; two-stage electrically driven air compressor; and unit vulcanizers for bead to bead reforming.

"1939 Consumer Market Data Handbook." Bureau of Foreign and Domestic Commerce, Washington, D. C. 480 pages. This handbook presents 82 series of consumer marketing data covering the 3,070 counties in the United States. Most of these series are shown for each of the 3,165 cities of 2,500 population or more, classified under five principal groups: (1) population and dwellings; (2) volume and type of business and industry; (3) employment and pay rolls; (4) retail distribution by kinds of business; (5) related indicators of consumer purchasing power. Copies are obtainable from the Government Printing Office, Washington, D. C., at $1.75 each.

"NEMA Report of Determination of Maximum Permissible Current-Carrying Capacity of Code Insulated Wires for Building Purposes." National Electrical Manufacturers Association, 155 E. 44th St., New York, N. Y. This constitutes the association's final report of the findings of its rubber-covered building wire section on the current-carrying capacity of rubber-insulated building wire. Data on performance and heat-resistant grades of insulation are covered as well as Code Grade. Copies of the report may be obtained at 25¢ each.

"Catalog and Price List of Eastman Organic Chemicals. Thirtieth Edition." Eastman Kodak Co., Rochester, N. Y. 128 pages. In the preparation and distribution of the 3,200 chemicals listed in this catalog, the firm regards itself primarily as serving research workers in every field of chemistry.

"Truck and Bus Tire Service Manual." The B. F. Goodrich Co., Akron, O. 16 pages. This manual on truck and bus tires, designed to assist users in overcoming premature tire failure, points out the common causes of such failure: excessive tread wear, crown breaks, and abnormal heat generation. Contributing factors in length of tire life: load carried, distribution of weight, operating speeds, road surface conditions, and atmospheric temperature are discussed; while the importance of correct tire type and size, proper inflation, and equally mated tires on dual installations is stressed.

"Industrial Textiles Directory." 1939 Edition. *Daily News Record*, 8 E. 13th St., New York, N. Y. 88 pages. This directory, priced at $1, presents the names and addresses of those mills making fabrics and yarns that go definitely into the industrial trades and of those finishers whose work is suited to meet industrial needs. Among the gray goods covered are drills, ducks, osnaburgs, print cloths, sheetings, and tire fabrics. The directory also includes finished goods, spun rayon yarns, cotton yarns, cloth brokers, finishers, testing laboratories, textile engineers, and thread manufacturers.

"Important Books." Chemical Publishing Co., Inc., 146 Lafayette St., New York, N. Y. 36 pages. This catalog includes brief information regarding many domestic and imported books on chemistry, physics, mathematics, medicine, metallurgy, machinery, engineering, biology, general science, business, manufacturing, formularies, and technical dictionaries. A copy will be sent to any one interested on receipt of stamps to cover postage.

"New Horizons of Industry through Research." General Motors Corp., 1775 Broadway, New York, N. Y. 62 pages. Within the pages of this booklet are the answers received from the heads of America's great corporations to the question "What is new? What is ahead along the industrial road?" Approximately 250 products and processes in 21 different fields including the rubber industry are previewed. In the preface Alfred P. Sloan, Jr., chairman of General Motors Corp., points out that in his opinion these results of industry demonstrate what can be done in the development of new products and the improvement of old ones, thus getting us started toward prosperous times through constructive work.

"The Vanderbilt News." May-June, 1939. R. T. Vanderbilt Co., 230 Park Ave., New York, N. Y. 28 pages. The compounding properties and commercial applications of an improved Thermax soft carbon black, essentially non-staining and non-bleeding, are discussed in this issue. The new product, it is claimed, may be used to advantage in black stocks that are to be in contact with white compounds and as a loading material for gasoline-resistant compounds of rubber, Neoprene, or "Thiokol." The use of Thermax in place of inexpensive fillers to give improved quality at equal cost is supported by physical test data and cost figures.

"The Conference Board Studies in Personnel Policy. No. 13. Developments in Company Vacation Plans." National Industrial Conference Board, Inc., 247 Park Ave., New York, N. Y. 24 pages. Based on a study of the vacation plans of 210 companies, employing over a million workers, this booklet provides an analysis of shut-down, staggered, and other kinds of vacation plans, eligibility provisions, vacation seasons, and vacation pay schedules. Excerpts from, or reproductions of, the vacation plans of ten leading companies are included.

"Okolite." Okonite Co., Passaic, N. J. 8 pages. This illustrated booklet describes the application and advantages of Okolite insulated cables for high voltage circuits and includes comparative curves, showing operating efficiency, load carrying ability, and moisture resistance, with data on installation methods, tests, and designs.

"The Trade Agreement between the United States and the United Kingdom." Vol. 1. United States Tariff Commission, Washington, D. C. Part I contains a complete list of articles on which concessions were made and an analysis of recent trade between the United States and the United Kingdom with a brief history of tariffs. Part II presents an analysis of concessions made in the agreement. Volumes II-VIII have previously been released, and the complete set is now available.

"Care and Use of Gas Masks." Davis Emergency Equipment Co., 55 Van Dam St., New York, N. Y. This bulletin covers the important points to be observed in selecting, testing, using, and caring for the several types of gas masks used in industry and their accessories.

BOOK REVIEWS

"Annual Report on the Progress of Rubber Technology." Vol. II. 1938. Published by The Institution of the Rubber Industry, 12 Whitehall, London, S.W.1, England. Paper, 7¼ by 9¾ inches, 141 pages. Subject and author indexes. Price: to non-members of I.R.I., 10s. 6d.; to members, 2s. 6d.

Volume II of this annual progress review summarizes the advances during 1938 in the principal branches of rubber manufacture and technology. The 24 chapters of the present work cover essentially the same ground as did Volume I; while the same authors of separate chapters are retained with six exceptions. Each phase of the subject matter is comprehensively dealt with by an authoritative worker in that field. Total references to the literature and patents which appear at the end of respective chapters number 1,002.

"Cause and Control of the Business Cycle." Second Edition. E. C. Harwood. Published by the American Institute for Economic Research, Cambridge, Mass. 1939. Cloth, 5¼ by 8 inches, 224 pages. Index. Price $2.

The first edition of this book was published in 1932. Although basic principles in business cycle theory remain substantially unchanged, this book has been brought up-to-date in a non-technical presentation, primarily for the layman. A special introduction contains the technical aspects of the latest developments on this subject. After citing the problem of the business cycle, the author discusses production and distribution and points out the basic maladjustment in our money-credit scheme. Unemployment, overproduction, and installment selling are discussed in the light of the theory advanced. Various popular panaceas for our economic ills are dealt with, and one chapter discusses the function and significance of gold. The author offers a number of control possibilities for leading us toward a solution of our economic problems.

"First Report on Viscosity and Plasticity." Second Edition. Prepared by the Committee for the Study of Viscosity of the Academy of Sciences at Amsterdam. Nordemann Publishing Co., Inc., 215 Fourth Ave., New York, N. Y. 1939. Cloth, 7 by 10¼ inches, 273 pages. Indexed. Price $7.

The first edition of this report on viscosity and plasticity appeared in 1935. In this second impression a few minor changes have been introduced, and there have been added references to passages of the "Second Report on Viscosity and Plasticity" (published in April, 1938) where this seemed useful, and to some papers of importance not mentioned in the original edition or having appeared after its publication. Certain additions of greater extent

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Patents and Trade Marks

MACHINERY

United States

2,158,167. **Tire Slitter.** G. F. Wikle, Detroit, Mich., assignor, by mesne assignments, to United States Rubber Co., New York, N. Y.
2,158,206. **Latex Trunks Form.** A. N. Spanel, Rochester, N. Y.
2,158,575. **Cabinet for Powdering Rubber Gloves.** R. V. and K. Foster, both of Jackson Heights, N. Y.
2,158,703. **Patch Vulcanizer.** F. E. Kite, Los Angeles, Calif.
2,158,747. **Tire Wrapper Remover.** A. G. Doros, Elizabeth, N. J.
2,159,543. **Vulcanizer.** W. J. Baker, W. Somerville, assignor to Boston Woven Hose & Rubber Co., Cambridge, both in Mass.
2,159,786. **Tread Slitter.** W. F. Errig, Philadelphia, Pa., and E. S. De Hart, Collingswood, N. J., assignors to Peco Mfg. Corp., Philadelphia, Pa.
2,159,850. **Golf Ball Coating Machine.** C. W. Haynes, Springfield, assignor to Fisk Rubber Corp., Chicopee Falls, both in Mass.
2,159,852. **Pressing Apparatus for Valve Stems, Etc.** O. F. Homeier, Akron, O., assignor to B. F. Goodrich Co., New York, N. Y.
2,160,143. **Tire Buffing Equipment.** C. J. Hayton, Los Angeles, Calif.
2,160,182. **Rubber Floor Covering Making Apparatus.** W. S. Vrooman, Pontiac, Mich., assignor to Paine & Williams Co., Cleveland, O.
2,160,312. **Vulcanizer.** H. Karthaus, assignor to Continental Gummi-Werke A.G., both of Hannover, Germany.
2,160,495. **Thread Supplier.** R. S. Francis, Rumford, R. I., assignor, by mesne assignments, to United States Rubber Co., New York, N. Y.
2,160,805. **Press.** E. M. Winegar, assignor to Ohio Rubber Co., both of Willoughby, O.
2,161,117. **Tire Stitcher.** G. F. Wikle, Detroit, Mich., assignor, by mesne assignments, to United States Rubber Co., New York, N. Y.
2,161,250. **Elastic Yarn Knitter.** J. L. Getaz, Maryville, Tenn.
2,161,442. **Vulcanizer.** A. L. Wallace, Brooklyn, N. Y., assignor to R. H. Crook, as trustee.
2,161,546. **Ball Winder.** F. Honig, Pawtucket, R. I.
2,161,775. **Inner Tube Making Device.** G. C. Miller, Los Angeles, and R. C. Sourwine, Walnut Park, assignors to Samson Tire & Rubber Corp., Los Angeles, both in Calif.

United Kingdom

499,985. **Tire Spreader.** C. Makin.
500,529. **Vulcanizer.** Boston Woven Hose & Rubber Co.
500,925 and 500,932. **Belt Vulcanizer.** Boston Woven Hose & Rubber Co.

Germany

673,917. **Mill Roll.** Fried. Krupp Grusonwerk A.G., Magdeburg-Buckau.
675,768. **Device to Make Rubber and Fabric Objects with Raised Surface Designs.** Hungaria Guttapercha es Gummiarugyar R.T., Budapest, Hungary. Represented by G. Lotterhos, Frankfurt a.M., and M. Eule, Berlin.
675,999. **Mold Core.** F. Szezinsky, Berlin, and Deutsch & Neumann, Berlin-Charlottenburg.

PROCESS

United States

21,090. (Reissue.) **Rubber Thread.** T. L. Shepherd, London, England.
2,158,083. **Expanded Rubber.** F. W. Peel, London, England, assignor to Rubatex Products, Inc., New York, N. Y.
2,158,086. **Cellular Rubber Sheets.** D. Roberts, New York, N. Y., and J. S. Reid, Cleveland, O., assignors to Rubatex Products, Inc., New York, N. Y.
2,158,153. **Footwear.** E. F. Roberts, Rye, N. Y., and A. G. McKinnon, Montreal, P. Q., Canada, assignors, by mesne assignments, to United States Rubber Co., New York, N. Y.
2,159,213. **Upholstery Padding.** J. A. Howard, assignor of one-third to Moulded Hair Co., Ltd., both of London, and one-third to J. A. Talalay, Bedford, both in England.
2,159,638. **Fiber Article.** M. O. Schur, assignor to Brown Co., both of Berlin, N. H.
2,161,036. **Coating Underground Pipe.** H. F. Gremmel, Rutherford, N. J., and H. D. Rice, Barrington, R. I., assignor, by mesne assignments, to United States Rubber Co., New York, N. Y.
2,161,080. **Upholstery.** E. A. Murphy, Birmingham, G. W. Trobridge, Sutton Coldfield, and A. N. Ward, Birmingham, assignors to Dunlop Rubber Co., Ltd., London, all in England.
2,161,083. **Shoe Counter.** A. F. Owen, assignor to Latex Fiber Industries, Inc., both of Beaver Falls, N. Y.
2,161,281. **Rubber Articles.** M. Carter, Trenton, N. J., assignor, by mesne assignments, to Rubber Products, Inc., Chicago, Ill.
2,161,308. **Cellular Rubber Goods.** E. A. Murphy, A. A. Round, and T. Norcross, all of Birmingham, assignors to Dunlop Rubber Co., Ltd., London, both in England.
2,161,445. **Rubber Compounding.** J. M. Ball, Pelham, assignor to R. T. Vanderbilt Co., Inc., New York, both in N. Y.
2,161,447. **Insulating Electrical Conductor.** R. E. Bishop, S. Orange, N. J., assignor to A. C. Horn & Co., Long Island City, N. Y.
2,161,454. **Rubber Hydrochloride Film.** W. C. Calvert, Chicago, Ill., assignor to Wingfoot Corp., Wilmington, Del.
2,161,455. **Latex Concentration.** A. M. Clifford, Stow, O., assignor to Wingfoot Corp., Wilmington, Del.
2,161,490. **Inner Tube.** J. W. Waber, Chicago, Ill.
2,161,731. **Rubber Dispersion from Latex.** N. H. van Harpen, Medan, assignor to Algemeene Vereeniging Van Rubberplanters Ter Oostkust Van Sumatra, both of Sumatra, Netherland India.

Dominion of Canada

381,563. **Rubber Processing.** Industrial Process Corp., assignee of H. R. Minor, both of Dayton, O., U. S. A.
381,723. **Sponge Rubber.** Industrial Process Corp., assignee of H. R. Minor, both of Dayton, O., U. S. A.

United Kingdom

500,137. **Seaming Containers.** H. Zeigmeister.
500,442. **Cushioning Material.** W. Binns.
500,454. **Sponge Rubber.** H. R. Minor.
500,491. **Collapsible Tube.** Boots Pure Drug Co., Ltd., and W. J. Randall.
500,510. **Spinning Roller.** A. L. Freedlander.
500,515. **Artificial Rubber Threads.** Naamlooze Vennootschap De Bataafsche Petroleum Maatschappij.
500,542. **Attaching Rubber to Metal.** R. J. Reaney.
500,824. **Carpet.** J. R. Champion.

CHEMICAL

United States

2,158,138. **Rubber Derivatives.** J. McGavack, Leonia, N. J., assignor, by mesne assignments, to United States Rubber Co., New York, N. Y.
2,158,281. **Cable Compound.** J. G. Ford, Forest Hills, and C. F. Hill, Edgewood, assignors to Westinghouse Electric & Mfg. Co., E. Pittsburgh, all in Pa.
2,158,469. **Cork - Rubber Composition.** C. E. McManus, Spring Lake, N. J., assignor to Crown Cork & Seal Co., Inc., Baltimore, Md.
2,158,530. **Thermoplastic Rubber Derivatives.** I. Williams, Woodstown, N. J., assignor to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.
2,158,760. **Rubber Hydrohalides.** E. H. Morse, Nutley, N. J., and W. S. Johnston, New York, and E. L. Mack, Douglaston, assignors to Reynolds Research Corp., New York, both in N. Y.
2,159,152. **Moistureproof Coating Composition.** A. Hershberger, Kenmore, N. Y., assignor, by mesne assignments, to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.
2,160,162. **Adherent Rubber-Soap-Oil Composition.** A. J. Morway, Roselle, and J. C. Zimmer, Hillside, both in N. J., assignors to Standard Oil Development Co., a corporation of Del.
2,160,200. **Antioxidant.** R. F. Dunbrook and B. J. Humphrey, assignors to Firestone Tire & Rubber Co., all of Akron, O.
2,160,223. **Antioxidants.** L. Meuser, Naugatuck, and C. S. Dewey, Ches-

hire, both in Conn., assignors, by mesne assignments, to United States Rubber Co., New York, N. Y.

2,160,995, 2,160,996, and 2,160,997. **Synthetic Rubber Composition.** P. J. Wiezevich, Elizabeth, N. J., now by judicial change of name to P. J. Gaylor, assignor to Standard Oil Development Co., a corporation of Del.

2,161,024. **Coating Composition for Hard Rubber.** A. K. Doolittle, S. Charleston, W. Va., assignor to Carbide & Carbon Chemicals Corp., a corporation of N. Y.

2,161,038 and 2,161,039. **Rubber-Like Polymerization Products.** B. J. Habgood, R. Hill, and L. B. Morgan, all of Blackley, Manchester, England, assignors to Imperial Chemical Industries, Ltd., a corporation of Great Britain.

2,161,201. **Rubber Conversion Product.** J. J. Schaefer, Germantown, assignor to Sharples Solvents Corp., Philadelphia, both in Pa.

2,161,741. **Purified Mercaptothiazoles.** J. R. Gage, Akron, O., assignor to Wingfoot Corp., Wilmington, Del.

2,161,751. **Chlorinated Rubber Ink.** R. A. Shive, Bound Brook, J. E. Coffee, E. Orange, and R. H. Kienle, assignors to Calco Chemical Co., Inc., both of Bound Brook, both in N. J.

2,161,754. **Vulcanizing Agent.** G. W. Watt, Akron, O., assignor to Wingfoot Corp., Wilmington, Del.

Dominion of Canada

381,531. **Synthetic Insulating Composition.** Canadian General Electric Co., Ltd., Toronto, Ont., assignee of P. Nowak and H. Hofmeier, co-inventors, Berlin-Charlottenburg, Germany.

381,844. **Rubber-Resin Composition.** Barrett Co., New York, N. Y., assignee of D. F. Gould, Riverton, N. J., both in the U. S. A.

381,921. **Blowing Agent for Sponge Rubber.** Wingfoot Corp., Wilmington, Del., assignee of A. F. Hardman, Akron, O., both in the U. S. A.

United Kingdom

500,187. **Antioxidants.** Wingfoot Corp.

500,229. **Fibrous Molding Compositions.** E. Rheinberger.

500,298. **Pastes.** G. W. Johnson, (I. G. Farbenindustrie A.G.).

500,350. **Latex-Resin Compositions.** Pinchin, Johnson & Co., Ltd., and E. A. Bevan.

500,351. **Latex Paint.** Pinchin, Johnson & Co., Ltd., and E. A. Bevan.

500,467. **Carbon Black.** Auerges. A.G., (formerly Degea A.G.).

500,492. **Latex-Cork Expansion Joint Compound.** Boots Pure Drug Co., Ltd., and W. J. Randall.

500,615. **Wetting Agent.** G. W. Johnson, (I. G. Farbenindustrie A.G.).

500,769. **Synthetic Rubber.** I. G. Farbenindustrie A.G.

500,949. **Adhesive Resin Compositions.** E. I. du Pont de Nemours & Co., Inc.

Germany

675,148. **Vulcanizable Rubber Mass for Bonding to Metal.** Chrysler Corp., Highland Park, Mich., U. S. A. Represented by G. Bertram and K. Lengner, both of Berlin.

675,433. **Rubber Conversion Products.** Dr. Kurt Albert G.m.b.H., Chemische Fabriken, Wiesbaden-Biebrich.

676,136. **Softener.** I. G. Farbenindustrie A.G., Frankfurt a.M.

GENERAL

United States

2,158,194. **Photographic Material.** A. Murray, Rochester, N. Y., assignor, by mesne assignments, to Eastman Kodak Co., Jersey City, N. J.

2,158,207. **Rubber Garment.** A. N. Spánel, Rochester, N. Y.

2,158,212. **Coupling.** E. B. Anderson, Rockford, assignor to Borg-Warner Corp., Chicago, both in Ill.

2,158,254. **Windshield Wiper.** S. E. Rosenberg, Brockton, Mass.

2,158,297. **Refrigerator Seal.** E. B. Newill and A. A. McCormack, both of Dayton, O., assignors, by mesne assignments, to General Motors Corp., a corporation of Del.

2,158,398. **Tire.** T. Bryant, Cross Plains, Tex.

2,158,492. **Cable System.** W. M. Bishop, Huntington, assignor to Bell Telephone Laboratories, Inc., New York, both in N. Y.

2,158,506. **Foundation Garment.** E. R. Kaupp, Forest Hills, N. Y., assignor to Vogue Mfg. Co., Newark, N. J.

2,158,571. **Ice Cap.** R. G. Culp, Conemaugh, Pa.

2,158,576. **Tire Inflating Tube.** E. E. Glassley, S. Whitley, Ind.

2,158,624. **Brake.** C. E. Gregory, Chicago, Ill.

2,158,631. **Textile Stretcher Roller Casing.** H. W. Mettler, Geneva, Switzerland.

2,158,632. **Textile Stretcher.** H. W. Mettler, Geneva, Switzerland.

2,158,764. **Stethoscope.** S. Silka, Paris, France.

2,158,837. **Packaging Liquids.** F. M. Schukraft, Oak Park, Ill.

2,158,890. **Connection Device.** L. X. Antelme, Paris, France.

2,158,947. **Trot Line Jig.** O. W. Purdum, Atchison, Kan.

2,159,096. **Vacuum Comb.** C. E. Mitchell, Victoria, B. C., Canada.

2,159,119. **Legging.** I. C. Allen, Wilkinsburg, Pa.

2,159,133. **Psychrometer.** R. R. Chappell, Richmond, Va., and K. E. Whitney, Baltimore, Md., assignors to Bendix Aviation Corp., South Bend, Ind.

2,159,161. **Collapsible Tube Closure.** E. Isler, assignor to Steatit-Verkaufsgesellschaft A.G. (Steatite Trading Ltd.), both of Basel, Switzerland.

2,159,235. **Vibration Suppressor.** J. M. Tyler, Birmingham, and T. C. Van Degrift, assignors to General Motors Corp., both of Detroit, both in Mich.

2,159,295. **Tooth Brush.** C. H. Seifert, Hempstead, N. Y.

2,159,302. **Flowerpot Covering.** K. Rab and K. Walter, both of Vienna, Germany.

2,159,520. **Supporting Surface for Mattresses, Cushions, Etc.** W. H. Chapman, Birmingham, England, assignor to Dunlop Tire & Rubber Corp., Buffalo, N. Y.

2,159,525. **Shoe Fitter Device.** J. L. Harris, New York, N. Y.

2,159,572. **Lingerie Pin.** P. F. Starr, New Bethlehem, Pa.

2,159,825. **Dust Guard.** R. R. Stevens, Forest Hills, assignor to Westinghouse Air Brake Co., Wilmerding, both in Pa.

2,160,034. **Bicycle Spring Fork Mechanism.** F. W. Schwinn, Chicago, Ill.

2,160,040. **Resilient Mounting.** C. M. Sloman and R. A. Merrill, Detroit, Mich., assignors, by mesne assignments, to United States Rubber Co., New York, N. Y.

2,160,078. **Corset.** M. Mayer, assignor to Vanity Corset Co., both of New York, N. Y.

2,160,156. **Stocking Suspender.** A. S. Kinnucan, Chicago, Ill.

2,160,199. **Wheel.** A. J. Cornelissen, Buffalo, N. Y.

2,160,204. **Electrical Conductor.** W. A. Gibbons, Montclair, N. J., assignor, by mesne assignments, to United States Rubber Co., New York, N. Y.

2,160,219. **Tire.** K. Kramis, Zurich, Switzerland.

2,160,246. **Windshield Wiper.** L. Zaiger, Lynn, Mass.

2,160,248. **Bellows Piston.** H. D. Colman, Rockford, Ill.

2,160,271. **Automobile.** V. W. Kliesrath, South Bend, Ind., assignor, by mesne assignments, to International Engineering Corp., Chicago, Ill.

2,160,297. **Typewriter.** R. G. Thompson, W. Hartford, Conn., assignor to Underwood Elliott Fisher Co., New York, N. Y.

2,160,299. **Game.** J. L. Zinngrabe, Chicago, Ill.

2,160,317. **Respirator.** N. Schwartz, New York, N. Y.

2,160,368. **Elastic Belt.** I. Monesson, Lakewood, N. J.

2,160,398. **Valve Stem.** J. C. Crowley, Cleveland Heights, assignor to Dill Mfg. Co., Cleveland, both in O.

2,160,422. **Battery Connector.** F. S. Shipman, assignor of one-half to R. Henry, both of Rock Island, Ill.

2,160,425. **Target.** A. A. Thompson, Taunton, assignor of one-half to L. McElwee, Boston, both in Mass.

2,160,473. **Sanitary Appliance.** E. I. Dunn, San Francisco, Calif.

2,160,515. **Well Packer.** A. Pranger, assignor to Guiberson Corp., both of Dallas, Tex.

2,160,567. **Sweat Band.** W. F. Sterne, assignor to American Allsafe Co., Inc., both of Buffalo, N. Y.

2,160,616. **Haircloth.** E. A. C. A. and P. C. L. A. Gheysens, both of Iseghem, Belgium.

2,160,656. **Golf Club Grip.** E. E. Hall, Chicago, Ill.

2,160,692. **Shoe.** H. Auerbach, Brookline, assignor to Continental Shoe Corp., Boston, both in Mass.

2,160,736. **Window Wiper.** E. C. Horton, Hamburg, assignor to Trico Products Corp., Buffalo, both in N. Y.

2,160,739. **Doll.** F. S. Hugus, Barberton, and L. R. Lower, Akron, assignors to Sun Rubber Co., Barberton, both in O.

2,160,757. **Valve Diaphragm.** S. Schulhoff, Baltimore, Md.

2,160,768. **Foot Guard.** H. N. Wasser, assignor to Ellwood Safety Appliance Co., both of Ellwood City, Pa.

2,160,868. **Shoe Machine Toe Rest.** A. R. Hubbard, Beverly, Mass., assignor to United Shoe Machinery Corp., Paterson, N. J.

2,160,960. **License Plate Trimming.** H. J. Dinstbir, Butler, Pa.

2,161,003. **Lubrication Seal.** A. R. Berman, Brooklyn, N. Y.

2,161,018. **Shipping and Display Container.** J. A. Clemens, Providence, R. I., assignor to Davol Rubber Co., a corporation of R. I.

2,161,047. **Shower Ring.** O. W. Holden, assignor to Knickerbocker Rubber Co., both of Chicago, Ill.

2,161,086. **Eraser Attachment.** M. Pipi, assignor to J. Dixon Crucible Co., both of Jersey City, N. J.

2,161,093. **Rubber Package.** L. L. Salfisberg, S. Orange, assignor to Ivers-Lee Co., Newark, both in N. J.
2,161,097. **Bottle Closure.** T. Schröder-Nielsen, Horten, Norway.
2,161,178. **Syringe.** H. B. Lermer, assignor, by mesne assignments, to Hygienic Tube & Container Corp., both of Newark, N. J.
2,161,203. **Hair Waving Device.** F. V. Schleimer, assignor to United States Appliance Corp., both of San Francisco, Calif.
2,161,225. **Bridged Load Expansion Plate.** A. C. Fischer, Chicago, Ill.
2,161,274. **Balloon.** V. Behrend, Neponsit, N. Y.
2,161,343. **Antiskid Chain Unit.** H. S. Fritts, Washington, N. J.
2,161,383. **Microporous Diaphragm.** W. L. Reinhardt, Shaker Heights, and L. E. Wells, Cleveland Heights, assignors to Willard Storage Battery Co., Cleveland, all in O.
2,161,384. **Tire Pressure Regulator and Automatic Pump.** M. Rinfret, Sunnyside, N. Y.
2,161,662. **Loom Picker.** H. M. Bacon, assignor to Dayton Rubber Mfg. Co., both of Dayton, O.
2,161,666. **Weather Stripping.** R. R. Cowen, assignor to New Jersey Rubber Co., both of Taunton, Mass.
2,161,682. **Windshield Wiper.** C. P. Rogers, Santa Barbara, Calif.

Dominion of Canada

381,224. **Stretching Apparatus.** E. Becker, München, Germany.
381,303. **Shoe Counter.** Paper Patents Co., Neenah, assignee of J. B. Catlin, Appleton, both in Wis., U. S. A.
381,327. **Injection Applicator.** Zonite Products Corp., New York, N. Y., assignee of W. Heidbrock, New Brunswick, N. J., both in the U. S. A.
381,365. **Corset.** C. S. McMichael, Toronto, Ont.
381,406. **Belt and Connector.** Dayton Rubber Mfg. Co., assignee of A. L. Freedlander, Dayton, O., U. S. A.
381,434. **Abrasive Sheet.** Minnesota Mining & Mfg. Co., a Delaware corporation, assignee of Minnesota Mining & Mfg. Co., a Minnesota corporation, both of St. Paul, Minn., assignee of D. O. Guth, Los Angeles, Calif., both in the U. S. A.
381,470. **Intestinal Bath Apparatus.** R. Fürst, assignee of A. Brosch, both of Vienna, Germany.
381,487. **Container Cover.** S. J. Brandstein, New York, N. Y., U. S. A.
381,491. **Foot Arch Supporting Sole.** D. C. Hubbard, Auburn, Me., U. S. A.
381,500. **Sponge Rubber Brush.** R. K. Metcalf, Toronto, Ont.
381,501. **Elastic Goods.** P. Schönfeld, Chemnitz, Germany.
381,579. **Undergarment.** R. Reis & Co., assignee of A. M. Reis, both of New York, N. Y., U. S. A.
381,638. **Resilient Body Deformation Control.** E. E. Kellems, Eugene, Ore., U. S. A.
381,659. **Nipple.** J. B. Whitbread, Detroit, Mich., U. S. A.
381,664. **Tilting Mechanism.** Bassick Co., assignee of W. F. Herold, both of Bridgeport, Conn.
381,667. **Tire Patch.** Bowes Seal Fast Corp., assignee of T. W. Mullen, both of Indianapolis, Ind., U. S. A.
381,681. **Escalator Roller.** Canadian Westinghouse Co., Ltd., Hamilton, Ont., assignee of P. W. Dempsey, Pittsburgh, Pa., U. S. A.
381,722. **Sponge Rubber.** Industrial Process Corp., assignee of H. R. Minor, both of Dayton, O.
381,733. **Abrading Element.** Minnesota Mining & Mfg. Co., St. Paul, Minn., assignee of H. G. Bartling, Chicago, Ill., both in the U. S. A.
381,803. **Shaft Seal.** G. P. Gilman, Chicago, Ill., U. S. A.
381,839. **Sponge Rubber Roller.** American Machine & Foundry Co., New York, N. Y., assignee of J. W. Leary, Bloomfield, N. J., both in the U. S. A.
381,891. **Refrigerator Threshold Plate.** Johns-Manville Corp., New York, N. Y., assignee of W. J. Hennessy, San Francisco, Calif., both in the U. S. A.
381,894. **Electrolytic Condenser.** P. R. Mallory & Co., Inc., Indianapolis, assignee of C. M. Blackburn, Morgantown, both in Ind., U. S. A.
381,897. **Abrasive Sheet.** Minnesota Mining & Mfg. Co., a Delaware corporation, assignee of Minnesota Mining & Mfg. Co., a Minnesota corporation, both of St. Paul, Minn., assignee of Materials & Equipment Corp., Gary, Ind., assignee of H. G. Bartling, Chicago, Ill., all in the U. S. A.

United Kingdom

498,554. **Motor-Cycle Spring Mounting.** Ariel Motors, Ltd., and F. Anstey.
498,947. **Vehicle Mudguard.** E. C. Ottaway, and London Passenger Transport Board.
498,979. **Coaster Hub.** Fichtel & Sachs A.G.
499,006. **Saddle.** E. Bergwall.
499,079. **Electromagnetic Interrupter.** Naamlooze Vennootschap Philips' Gloeilampenfabrieken.
499,105. **Ice Making.** General Motors Corp.
499,111. **Bangle.** S. Ford.
499,129. **Sifter.** Nordberg Mfg. Co.
499,143. **Road Surfacing Material.** Tar-Mac, Ltd., and H. Porter.
499,156. **Hair-Curler Pad.** R. M. McFadden.
499,170. **Trousers.** S. Simpson, Ltd., and S. Klein.
499,232. **Resilient Support.** Silentbloc, Ltd., and S. W. Jelley.
499,234. **Fluid-Pressure Jack.** A. W. G. Sprake.
499,260. **Tire Lever.** A. Piotrkowski.
499,276. **Bearing Support and Mount.** General Motors Corp.
499,293. **Oil Seal.** G. Angus & Co., Ltd., (H. Freudenberg).
499,298. **Joint.** Hardy, Spicer & Co., Ltd., and J. L. Hardy.
499,311. **Cable.** General Cable Corp.
499,375. **Vacuum-Cleaner Nozzle.** H. Wessel.
499,393. **Mercury Switch.** A. Cianchi.
499,410. **Wheel.** Roadless Traction, Ltd., P. H. Johnson, and R. Bawden.
499,413. **Lamp Making Machine.** A. Hofmann & Co.
499,414. **Joint.** Metalastik, Ltd., and M. S. Stern.
499,419. **Bag Making Machine.** L. L. Salfisberg.
499,433. **Resilient Mounting.** Metalastik, Ltd., and M. Goldschmidt.
499,448. **Elastic Cord.** Condelex Soc. Anon.
499,461. **Container Closure.** A. A. Thornton, (F. Gutmann & Co.).
499,463. **Gravure Printing Press.** V. F. Feeny, (Miehle Printing Press & Mfg. Co.).
499,470. **Footwear.** Calzatura Aerata Medusa Soc. Anon.
499,473. **Inking Apparatus.** F. Kraus.
499,568. **Clip.** G. Werner.
499,580. **Compound Sheet Material.** Mishawaka Rubber & Woolen Mfg. Co.
499,583. **Bust Support.** L. Stamm.
499,584. **Bottle.** Soc. of Chemical Industry in Basle.
499,603. **Stuffing-Box.** A. Leblond.
499,618. **Friction Wheel.** W. Sander.
499,620. **Flower Pot and Receptacle.** K. Rab and K. Walter.
499,656. **Ball.** J. J. H. Wilkinson.
499,667. **Inspection Cover.** Metalastik, Ltd., and M. Goldschmidt.
499,679. **Sole and Heel.** H. E. Theobald.
499,705. **Water-Waste-Preventer.** G. H. Gunn.
499,706. **Sound Recorder.** D. M. Mackie and C. Collaro.
499,729. **Stuffing-Box Packing.** C. H. Warman.
499,773. **Upholstery Stuffing.** H. T. Turnbull and Lintafelt, Ltd.
499,813. **Respiratory Appliance.** Soc. Industrielle Des Telephones (Constructions Electriques, Caoutchouc, Cables).
499,865. **Bottle Capper.** S. D. Young.
499,870. **Umbrella.** W. Barcroft.
499,886. **Waterproof Fabrics.** L. Gitmul.
499,889. **Vehicle Body.** Leyland Motors, Ltd., and C. C. Bailey.
499,896. **Corset or Brassiere.** W. Mass.
499,903. **Reservoir Marking Instrument.** A. E. Taylor.
499,906. **Cable.** Callender's Cable & Construction Co., Ltd., L. G. Brazier, and G. M. Hamilton.
499,911. **Tire Pressure Device.** G. D'O. Contri.
499,929. **Valve.** A. Rang.
499,942. **Flexible Screen or Shutter.** J. Drager.
499,959. **Dental Mold.** L. W. Meyer, (Erdle & Prange, Inc.).
499,981. **Valve.** F. Pearn & Co., Ltd., and H. W. Pearn.
499,982. **Windscreen Cleaner.** H. E. Hiley and R. S. Burn.
499,987. **Hot Water Bottle.** J. R. Buchanan.
500,004. **Resilient Support.** Getefo Ges. Fur Technischen Fortschritt.
500,011. **Lethal and Anaesthetic Chamber.** M. A. Saunders.
500,046. **Splint.** T. Parratt, W. J. Jarvis, and F. L. Evered.
500,070. **Plating or Pickling Vessel.** E. Wilkes.
500,082. **Apparatus for Coating Surfaces.** K. L. De Boer.
500,130. **Conveyer.** F. Bainbridge and H. Wood & Co., Ltd.
500,145. **Machine for Making and Filling Packets.** American Machine & Foundry Co.
500,169. **Sewing-Machine.** W. C. Fairweather, (Singer Mfg. Co.).
500,192. **Kite with Rotor Supporting System.** C. B. Chupp.
500,203. **Pipe Line.** Turner & Newall, Ltd., and L. A. Turner.
500,216. **Blood-Transfusion Apparatus.** W. J. Tennant, (W. B. Cooksey).

Germany

675,169. **Rim Support for Tube Valves.** Continental Gummi-Werke A.G., Hannover.
675,170. **Handle.** K. Hagebeuker, Sol-
(*Continued on page 80*)

Market Reviews

CRUDE RUBBER

New York Quotations

New York outside market rubber quotations in cents per pound

	June 27, 1938	May 24, 1939	June 27, 1939
Plantations			
Rubber latex..*gal.*	54/55	60/61	60/61
Paras			
Upriver fine	13¼	14⅜	14⅜
Upriver fine	*16¼	*17¼	*16⅝
Upriver coarse...	9	10	10
Upriver coarse...	*13	*14¾	*15¼
Islands fine......	13	13¾	14
Islands fine......	*15½	*16	*16¼
Acre, Bolivian fine	13½	14½	14½
Acre, Bolivian fine	*16½	*17½	*16¾
Beni, Bolivian fine	13¾	15	15
Madeira fine	13¼	14½	14⅜
Caucho			
Upper ball.......	9	10	10
Upper ball.......	*13	*14¾	*15¼
Lower ball.......	8¾	9¾	9½
Pontianak			
Pressed block ...	12/25	9/16	9/16
Guayule			
Duro, washed and dried	10½	13	13
Ampar	11	13¼	13¼
Africans			
Rio Nuñez	15	14	14
Black Kassai ...	15	14	14
Prime Niger flake.	24	25	25
Gutta Percha			
Gutta Siak	11½	9¼	9¾
Gutta Soh	16	14	15
Red Macassar...	1.25/1.30	75/1.20	90/1.20
Balata			
Block, Ciudad Bolivar	27	..	..
Manaos block ...	27	30	31
Surinam sheets...	37	42	40
Amber	39	44	42

*Washed and dried crepe. Shipments from Brazil.

Commodity Exchange

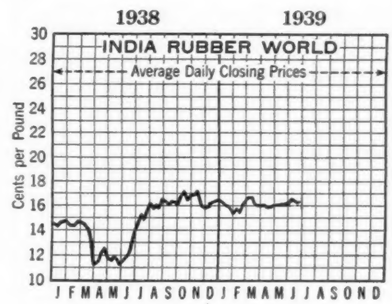
TABULATED WEEK-END CLOSING PRICES

Futures	Apr. 29	May 27	June 3	June 10	June 17	June 24
May	15.75	.....	.....	.....	.....	.....
June ...	15.80	16.34	16.37	16.43	16.15	16.27
July ...	15.85	16.39	16.39	16.45	16.17	16.29
Sept. ...	15.87	16.40	16.41	16.54	16.24	16.36
Dec. ...	15.94	16.45	16.45	16.58	16.29	16.39
Mar. ...	15.93	16.48	16.46	16.62	16.33	16.45
May ...	.....	.....	16.48	16.64	16.35	16.49
Volume per week (tons)	.11,450	6,510	3,520	3,010	3,870	5,450

THE Commodity Exchange table published here shows prices of representative future contracts of the New York market for the last two months.

During June the rubber futures market held generally steady. The slight price fluctuations in the local market followed the trend of the London and Singapore markets. Prices sagged slightly at mid-month upon reports of Japanese and British difficulties in Asia, but regained lost ground during the following week. Closing at 16.49¢ per pound on June 1, the price of September futures moved within a narrow range during the month and closed at 16.39¢ per pound on June 21. The closing price on June 27 was 16.37¢ per pound.

The decision of the International Rubber Regulation Committee to fix permissible exports for the third quarter at 55% of the basic figure in the face of declining world stocks and an expected sustained world absorption above the permissible amounts places the statistical position of rubber on un-



New York Outside Market—Spot Ribbed Smoked Sheets

certain ground and threatens the price stability of the market. In commenting upon this point, E. G. Holt, chief, Leather and Rubber Division, Bureau of Foreign and Domestic Commerce, points out in a recent *Rubber News Letter* that in many respects the present situation parallels that of late 1936: there are the same low, declining, and poorly distributed stocks; the same hesitant, gradual releases of increased production; the same delayed price reaction to lowering stocks; consumption in 1939 is expected to exceed 1938; United Kingdom stocks are being drawn upon again somewhat, from the United States; the price range between various grades of plantation rubber has narrowed; producers intermittently express dissatisfaction with the price level which has obtained so long.

The significant differences from the

New York Outside Market—Spot Closing Prices—Plantation Grades—Cents per Pound

	May, 1939								
	22	23	24	25	26	27*	29	30†	31
No. 1 Ribbed Smoked Sheet	16½	16 3/16	16½	16 7/16	16½	..	16 9/16	..	16 11/16
No. 1 Thin Latex Crepe...	17 13/16	17⅞	18 3/16	18⅛	18 3/16	..	18¼	..	18⅜
No. 2 Thick Latex Crepe..	18½	18 9/16	18⅞	18 13/16	18⅞	..	18 15/16	..	19 1/16
No. 1 Brown Crepe......	15¾	15 13/16	16⅛	16 1/16	16⅛	..	16 3/16	..	16 5/16
No. 2 Brown Crepe......	15⅝	15 11/16	16	15 15/16	16	..	16 1/16	..	16 3/16
No. 2 Amber............	15¾	15 13/16	16⅛	16 1/16	16⅛	..	16 3/16	..	16 5/16
No. 3 Amber............	15⅝	15 11/16	16	15 15/16	16	..	16 1/16	..	16 3/16
Rolled Brown	14⅜	14 7/16	14¾	14 11/16	14¾	..	14⅞	..	15

	June, 1939														
	1	2	3*	5	6	7	8	9	10*	12	13	14	15	16	17*
No. 1 Ribbed Smoked Sheet	16⅝	16 9/16	..	16 9/16	16½	16½	16 9/16	16⅝	..	16½	16 7/16	16 5/16	16⅜	16⅜	..
No. 1 Thin Latex Crepe...	18 5/16	18¼	..	18¼	18 3/16	18 3/16	18¼	18 5/16	..	18 3/16	18⅛	18	18 1/16	18 1/16	..
No. 2 Thick Latex Crepe..	19	18 15/16	..	18 15/16	18⅞	18⅞	18 15/16	19	..	18⅞	18 13/16	18 11/16	18¾	18¾	..
No. 1 Brown Crepe......	16¼	16 3/16	..	16 3/16	16⅛	16⅛	16 3/16	16¼	..	16⅛	16 1/16	15 15/16	16	16	..
No. 2 Brown Crepe......	16⅛	16 1/16	..	16 1/16	16	16	16 1/16	16⅛	..	16	15 15/16	15 13/16	15⅞	15⅞	..
No. 2 Amber............	16¼	16 3/16	..	16 3/16	16⅛	16⅛	16 3/16	16¼	..	16⅛	16 1/16	15 15/16	16	16	..
No. 3 Amber............	16⅛	16 1/16	..	16 1/16	16	16	16 1/16	16⅛	..	16	15 15/16	15 13/16	15⅞	15⅞	..
Rolled Brown	14 15/16	14⅞	..	14⅞	14 13/16	14 13/16	14⅞	14 15/16	..	14 13/16	14¾	14⅝	14 11/16	14 11/16	..

*Closed. †Holiday.

New York Outside Market (Continued)

	June, 1939					
	19	20	21	22	23	24*
No. 1 Ribbed Smoked Sheet.............	16 7/16	16½	16½	16½	16½	..
No. 1 Thin Latex Crepe..............	18⅛	18 3/16	18 3/16	18 3/16	18 3/16	..
No. 2 Thick Latex Crepe..............	18 15/16	19	19	19	19	..
No. 1 Brown Crepe..............	16 1/16	16⅛	16⅛	16⅛	16⅛	..
No. 2 Brown Crepe..............	15 15/16	16	16	16	16	..
No. 2 Amber	16 1/16	16⅛	16⅛	16⅛	16⅛	..
No. 3 Amber	15 15/16	16	16	16	16	..
Rolled Brown	14¾	14 13/16	14 13/16	14 13/16	14 13/16	..

*Closed.

U. S. Exports of Mechanicals[1]

	Thousands of Pounds					Total	
Year	Hose	Belting	Packing	Tape	Thread	Pounds	Dollars
1932......	2,591	1,486	956	636	1,249	6,916,698	2,531,301
1933......	3,064	1,793	1,018	599	1,448	7,922,367	2,899,206
1934......	4,348	2,438	1,100	550	1,121	9,556,054	3,650,701
1935......	4,043	2,640	1,561	582	1,155	9,981,453	3,933,414
1936......	4,844	2,649	1,522	669	908	10,591,513	4,362,381
1937......	5,161	3,256	1,761	796	676	11,608,638	5,032,396
1938......	4,391	2,808	1,126	667	498	9,489,784	4,204,381

[1] "Rubber Products Trade Notes," May 20, 1939, U. S. Dept. of Commerce.

late 1936 situation, according to Mr. Holt, include: a better general awareness of the situation; there are now some small excess stocks on estates; a barter proposal (cotton for rubber) adds to market uncertainties; sterling has been lower relative to dollars than in 1936; Germany doubtless has a considerably larger domestic stock of crude rubber; Japan is reducing rubber imports to minimum requirements; reclaimed rubber and synthetic rubber are gaining headway; in 1936 shipments from producing countries were below permissible exports, but now they are well ahead of permissible exports.

New York Outside Market

The outside market continued quiet in June, with very little factory or shipment business reported. Offerings from the Far East were again scarce and too high for the local market.

In company with the futures market, the outside market held steady within narrow limits during the month. No. 1 ribbed smoked sheets closed at 16⅝¢ per pound on June 1 and at 16½¢ per pound on June 21. The closing price on June 27 was 16½¢ per pound.

The week-end closing prices on No. 1 ribbed smoked sheets follow: June 3, 16$\frac{9}{16}$¢; June 10, 16⅝¢; June 17, 16⅝¢; and June 24, 16½¢.

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(*Continued from page 63*)

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THE PNEUMATIC TIRE AND FARM VEHICLES. M. J. Baratte, *Rev. gén. caoutchouc*, Apr., 1939, pp. 96-98.

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Rumania

The Mira Rubber Factory, in the Jilava district, Rumania, closed on August 23, 1938, by the Defense Ministry, may reopen under an order of May 13, 1939.

IMPORTS, CONSUMPTION, AND STOCKS

United States and World Statistics of Rubber Imports, Exports, Consumption, and Stocks

Twelve Months	U. S. Imports* Tons	U. S. Consumption¶ Tons	U. S. Stocks Mfgrs., Importers, Dealers, Etc.† Tons	U. S. Stocks Afloat† Tons	U. K.—Public Warehouses, London Liverpool†‡ Tons	Singapore and Penang Dealers and Port Stocks†‡ Tons	World Production (Net Exports)‡ Tons	World Consumption Estimated‡ Tons	World Stocks†‡§ Tons
1936	490,858	575,000	223,000	56,567	78,462	26,969	857,900	1,045,295	538,028
1937	584,851	543,600	262,204	63,099	57,785	44,792	1,139,800	1,104,991	639,021
1938	400,178	437,031	231,500	45,105	86,853	27,084	894,947	940,578	586,776
1938									
Jan.	42,135	31,265	276,497	57,356	62,108	48,494	80,339	70,141	636,246
Feb.	43,930	25,357	292,067	47,459	71,516	46,241	81,178	63,951	651,520
Mar.	35,967	32,389	301,762	41,882	76,617	50,797	82,024	80,467	672,922
Apr.	30,807	29,730	303,901	39,071	82,754	40,614	87,235	71,613	670,905
May	27,410	30,753	300,907	32,859	87,215	40,598	65,152	78,418	654,516
June	26,011	32,540	294,796	32,079	92,312	44,729	71,195	72,310	670,298
July	22,918	34,219	282,785	40,400	95,252	45,529	80,208	74,305	668,744
Aug.	31,099	40,552	273,841	47,772	99,614	41,002	75,212	75,780	651,082
Sept.	37,374	40,183	268,094	48,927	98,140	35,386	71,212	80,143	637,886
Oct.	34,496	42,850	259,074	51,062	93,272	34,901	75,879	88,047	623,717
Nov.	31,054	49,050	242,592	51,114	90,073	31,255	67,370	94,465	592,545
Dec.	36,977	48,143	231,500	45,105	86,853	27,084	57,943	90,938	586,776
1939									
Jan.	39,082	46,234	223,879	48,210	80,643	30,975	87,431	89,046	584,429
Feb.	36,490	42,365	217,534	55,814	75,517	28,559	77,589	83,748	568,780
Mar.	38,989	50,165	205,936	55,981	72,235	23,255	76,310	95,273	545,589
Apr.	29,601	44,166	190,896	57,918	68,931	22,434	73,758	87,496	......
May	47,535	44,377	193,602	54,046	......	......	......	......	......

*Including liquid latex. †Stocks on hand the last of the month or year. ‡Statistical Bulletin of the International Rubber Regulation Committee. §Stocks at U. S. A., U. K., Singapore and Penang, Para, Manaos, regulated areas, and afloat. ¶Corrected to 100% from estimate of reported coverage.

CRUDE rubber consumption by United States manufacturers during May is estimated at 44,377 long tons, against 44,166 long tons during April, a rise of less than 1% over April and 44.3% over the 30,753 (revised) long tons consumed in May, 1938, according to R.M.A. statistics.

Gross imports of crude rubber for May are reported to be 47,535 long tons, an increase of 60.6% over the April figure of 29,601 long tons and 73.4% over the 27,410 long tons imported in May, 1938.

Domestic stocks of crude rubber on hand May 31 are figured at 193,602 long tons, against April 30 stocks of 190,896 long tons and 300,907 (revised) long tons for May 31, 1938.

Crude rubber afloat to U. S. ports as of May 31 is estimated at 54,046 long tons, compared with 57,918 long tons afloat on April 30 and 32,859 long tons afloat on May 31, 1938.

London and Liverpool Stocks

Week Ended	London (Tons)	Liverpool (Tons)
May 27	43,250	21,260
June 3	43,284	22,224
June 10	43,625	21,808
June 17	42,989	21,542
June 24	42,598	20,775

Siam

According to news reports, Singora and Naken Sridharmaraj are flooded with counterfeit rubber coupons which find a good market there. The authorities are said to be well informed of these activities, but so far the dealers have managed to escape.

RUBBER SCRAP

THE demand for scrap rubber became somewhat more active during June, reflecting the generally optimistic view held for the near future in the rubber industry. The market is somewhat firmer with four grades of tire scrap showing small price increases. All other grades continue at last month's levels except No. 1 Red Mechanicals which have receded ¼¢ per pound.

CONSUMERS' BUYING PRICES

(Carload Lots for June 21, 1939)

		Prices
Boots and Shoes		
Boots and shoes, black....	*lb.*	$0.01 /$0.01⅛
Colored	*lb.*	.00¾/ .00⅞
Untrimmed arctics	*lb.*	.00¾/ .00⅞
Inner Tubes		
No. 1, floating............	*lb.*	.08½/ .09
No. 2, compound.........	*lb.*	.03⅜/ .03¾
Red	*lb.*	.03½/ .03¾
Mixed tubes	*lb.*	.03½/ .03⅝
Tires (Akron District)		
Pneumatic Standard		
Mixed auto tires with beads	*ton*	11.50 /12.00
Beadless	*ton*	15.00 /16.00
Auto tire carcass.......	*ton*	20.00 /22.00
Black auto peelings.....	*ton*	20.00 /21.00
Solid		
Clean mixed truck.....	*ton*	27.00 /28.00
Light gravity	*ton*	35.00 /36.00
Mechanicals		
Mixed black scrap	*ton*	15.00 /17.50
Hose, air brake..........	*ton*	20.00 /22.50
Garden, rubber covered.	*ton*	10.00 /12.50
Steam and water, soft..	*ton*	10.00 /12.50
No. 1 red.................	*lb.*	.02½/ .02¾
No. 2 red.................	*lb.*	.02¼/ .02½
White druggists' sundries..	*lb.*	.03¾/ .04
Mixed mechanicals.........	*lb.*	.02¼/ .02½
White mechanicals	*lb.*	.03⅝/ .03¾
Hard Rubber		
No. 1 hard rubber	*lb.*	.11 / .11½

COMPOUNDING INGREDIENTS

A SLIGHT seasonal recession in the demand for compounding ingredients was evident during June. With a large number of factory shutdowns anticipated during early July, it is expected that a gradual decline in activity will continue until mid-month. A resumption of business to the favorable first quarter level should take place then if replacement tire sales reach expected volume. An earlier appearance of 1940 automobile models this year should also favor a quick upturn in rubber manufacturing activity. In general prices of compounding ingredients continue at last month's levels.

CARBON BLACK. Sales of carbon black slackened somewhat during the past month with a slowing down in tire production. No change in the basic price has been reported. According to the Bureau of Mines, total sales of carbon black in 1938 were 411,442,000 pounds, or 16% less than in 1937. Domestic sales totaled 243,474,000 pounds, or 20% less than the previous year; while exports, after increasing for three years, declined 9% to 167,968,000 pounds.

Reports from Japan indicate that one company there is selling a carbon black substitute made from pulverized lignite mixed with 10 to 20% of carbon black.

FACTICE OR RUBBER SUBSTITUTE. The demand for rubber substitutes is fair, with indications of improved business for the near future. Prices are unchanged.

LITHARGE. Fair activity was shown during the period under review. The price advanced five points as a result of the increase in the price of pig lead. New quotations in car lots are 6.30 to 6.55¢ per pound for delivery in bags.

RUBBER CHEMICALS. The demand for accelerators and antioxidants declined slightly during June although renewed activity is expected by mid-July. Prices remain substantially unchanged.

RUBBER SOLVENTS. Sales of these naphthas dropped off slightly during the past several weeks. However the market continued firm and prices unchanged.

STEARIC ACID. There was a fair demand for moderate quantities during June, and selling schedules hold at former levels.

TITANIUM PIGMENTS. As a result of the advent of the white footwear season and the somewhat greater demand for white sidewall tires, the consumption of titanium pigments in the rubber industry took a definite upturn last month. More emphasis is placed upon titanium dioxide than upon titanium calcium pigment. Prices are holding steady at levels established last December.

ZINC OXIDE. The demand for these pigments continued active during June. The market is firm, and prices remain unchanged.

New York Quotations

June 23, 1939

Prices Not Reported Will Be Supplied on Application

Abrasives

Pumicestone, powdered	*lb.*	$0.03	/$0.035
Rottenstone, domestic	*lb.*	.03	/ .035
Silica, 15	*ton*	38.00	

Accelerators, Inorganic

Lime, hydrated, l.c.l., New York	*ton*	20.00	
Litharge (commercial)	*lb.*	.0675/	.0725

Accelerators, Organic

A-1	*lb.*	.24	
A-10	*lb.*	.35	/ .40
A-11	*lb.*	.52	/ .65
A-19	*lb.*	.52	/ .65
A-32	*lb.*	.70	/ .80
A-77	*lb.*	.42	/ .55
A-100	*lb.*	.42	/ .55
Accelerator 49	*lb.*	.42	
737	*lb.*	.42	/ .43
737-50	*lb.*	.25	/ .26
808	*lb.*	.70	/ .72
833	*lb.*	1.15	
Acrin	*lb.*	.60	
Aldehyde ammonia	*lb.*	.70	
Altax	*lb.*	.55	/ .70
B-J-F	*lb.*	.50	/ .55
Beutene	*lb.*	.70	/ .75
Butyl Zimate	*lb.*	2.50	
C-P-B	*lb.*	2.00	
Captax	*lb.*	.50	/ .60
Crylene	*lb.*	.40	/ .47
Paste	*lb.*	.30	/ .36
D-B-A	*lb.*	2.00	
Delac A	*lb.*	.40	/ .50
O	*lb.*	.40	/ .50
P	*lb.*	.40	/ .50
Di-Esterex	*lb.*	.60	/ .70
N	*lb.*	.60	/ .70
DOTG (Di-ortho-tolylguanidine)	*lb.*	.44	/ .46
DPG (Diphenylguanidine)	*lb.*	.35	/ .45
El-Sixty	*lb.*	.50	/ .65
Ethylideneaniline	*lb.*	.42	/ .43
Ethyl Zimate	*lb.*	2.50	
Formaldehyde P.A.C.	*lb.*	.0625	
Formaldehydeaniline	*lb.*	.31	
Formaldehyde-para-toluidine	*lb.*	.52	/ .54
Guantal	*lb.*	.40	/ .50
Hepteen	*lb.*	.35	/ .40
Base	*lb.*	1.35	/ 1.50
Hexamethylenetetramine U.S.P.	*lb.*	.39	
Technical	*lb.*	.33	
Lead oleate, No. 999	*lb.*	.13	
Witco	*lb.*	.15	
Monex	*lb.*	2.35	
Novex	*lb.*		
O. N. V.	*lb.*	$1.00	/$1.10
O-X-A-F	*lb.*	.50	/ .55
Ovac	*lb.*	.50	/ .55
Para-nitroso-dimethylaniline	*lb.*	.85	
Pentex	*lb.*	1.00	/ 1.10
Pentex Flour	*lb.*	.15	/ .16
Pip-Pip	*lb.*	2.50	
Pipsolene	*lb.*	1.55	/ 1.85
R-2	*lb.*	1.40	/ 1.80
R-23	*lb.*	40	
R & H 50-D	*lb.*	.42	/ .43
Rotax	*lb.*	.60	/ .65
Safex	*lb.*	1.20	/ 1.30
Santocure	*lb.*	.85	
Super-sulphur No. 1	*lb.*	.50	
2	*lb.*	.18	/ .25
Tetrone A	*lb.*	2.70	
Thiocarbanilide	*lb.*	.24	/ .30
Thionex	*lb.*	2.35	
Trimene	*lb.*	.55	/ .65
Base	*lb.*	1.05	/ 1.20
Triphenylguanidine (TPG)	*lb.*	.45	
Tuads	*lb.*	2.35	
Ureka	*lb.*	.60	/ .75
Blend B	*lb.*	.60	/ .75
C	*lb.*	.56	/ .65
Vulcanex	*lb.*	.42	/ .43
Vulcanol	*lb.*	.85	
Z-B-X	*lb.*	2.50	
Zenite	*lb.*	.46	/ .48
A	*lb.*	.53	/ .55
B	*lb.*	.46	/ .48
Zimate	*lb.*	2.35	

Activator

Aero Ac 50	*lb.*		
Barak	*lb.*	.50	

Age Resisters

AgeRite Alba	*lb.*	1.50	/ 2.00
Exel	*lb.*	1.00	/ 1.40
Gel	*lb.*	.57	/ .75
Hipar	*lb.*	.65	/ .92
Powder	*lb.*	.52	/ .65
Resin	*lb.*	.52	/ .65
D	*lb.*	.52	/ .65
White	*lb.*	1.25	/ 1.65
Akroflex C	*lb.*	.56	/ .58
Albasan	*lb.*	.70	/ .75
Aminox	*lb.*	.52	/ .61
Antox	*lb.*	.56	
B-L-E	*lb.*	.52	/ .61
Powder	*lb.*	.65	/ .74
B-X-A	*lb.*	.55	/ .61
Copper Inhibitor X-872-A	*lb.*	1.15	
Flectol B.	*lb.*	.52	/ .65
H	*lb.*	.52	/ .65
White	*lb.*	.90	/ 1.15
M-U-F	*lb.*	$1.50	
Neozone (standard)	*lb.*	.63	
A	*lb.*	.52	/$0.54
B	*lb.*	.63	
C	*lb.*	.52	/ .54
D	*lb.*	.52	/ .54
E	*lb.*	.63	
Oxynone	*lb.*	.64	/ .80
Parazone	*lb.*	.68	
Permalux	*lb.*	1.20	
Santoflex B	*lb.*	.52	/ .65
Solux	*lb.*	1.30	
Thermoflex A	*lb.*	.65	/ .67
V-G-B	*lb.*	.52	/ .61

Alkalies

Caustic soda, flake, Columbia (400 lb. drums)	*100 lbs.*	2.70	/ 3.55
liquid, 50%	*100 lbs.*	1.95	
solid (700 lb. drums)	*100 lbs.*	2.30	/ 3.15

Antiscorch Materials

A-F-B	*lb.*	.35	/ .40
Antiscorch T	*lb.*	.90	
E-S-E-N	*lb.*	.35	/ .40
R-17 Resin (drums)	*lb.*	.10	
RM	*lb.*	1.25	
Retarder W	*lb.*	.36	
U.T.B.	*lb.*	.35	/ .40

Antisun Materials

Heliozone	*lb.*	.21	
Sunproof	*lb.*	.20	/ .25

Colors

BLACK			
Du Pont powder	*lb.*	.42	/ .44
Lampblack (commercial)	*lb.*	.15	
BLUE			
Brilliant	*lb.*		
Du Pont dispersed	*lb.*	.83	/ 3.60
Powders	*lb.*	2.25	/ 3.75
Prussian	*lb.*	.0375	
Toners	*lb.*	.08	/ 3.85
BROWN			
Mapico	*lb.*	.11	
GREEN			
Brilliant	*lb.*		
Chrome, light	*lb.*		
medium	*lb.*	.22	
oxide (freight allowed)	*lb.*		
Dark	*lb.*		
Du Pont dispersed	*lb.*	.98	/ 1.75
Powders	*lb.*	1.00	/ 2.00
Guignet's, Easton, Pa., bbls.	*lb.*	.70	
Light	*lb.*		
Toners	*lb.*	.85	/ 3.75

ORANGE

Du Pont dispersed	lb.	$0.88	/$0.90
Powders	lb.	.80	/ 2.50
Lake	lb.		
Toners	lb.	.40	/ 1.60

ORCHID

Toners	lb.	1.50	/ 2.00

PINK

Toners	lb	1.50	/ 2.00

PURPLE

Permanent	lb.		
Toners	lb.	.60	/ 2.10

RED

Antimony			
Crimson, 15/17%	lb.	.45	
R. M. P. No. 3	lb.	.48	
Sulphur free	lb.	.50	
R.M.P.	lb.	.52	
Golden 15/17%	lb.	.28	
7-A	lb.	.37	
Z-2	lb.	.23	
Aristi	lb.	1.75	
Cadmium, light (400 lb. bbls.)	lb.	.70	/ .75
Chinese	lb.		
Crimson	lb.		
Du Pont dispersed	lb.	.93	/ 2.05
Powders	lb.	.52	/ 1.05
Mapico	lb.	.0925	
Medium	lb.		
Rub-Er-Red, Easton, Pa., bbls.	lb.	.0925	
Scarlet	lb.		
Toners	lb.	.08	/ 2.00

WHITE

Lithopone (bags)	lb.	.04⅛/	.04⅜
Albalith Black Label-11	lb.	.04⅛/	.04⅜
Astrolith	lb.	.04⅛/	.04⅜
Azolith	lb.	.04⅛/	.04⅜
Cryptone-BA-19	lb.	.05⅝/	.05⅞
BT	lb.	.05⅝/	.05⅞
CB	lb.	.05⅝/	.05⅞
ZS No. 20	lb.	.07⅞/	.08⅛
86	lb.	.07⅞/	.08⅛
230	lb.	.07⅞/	.08⅛
Sunolith	lb.	.04⅛/	.04⅜
Ray-Bar	lb.	.05⅝/	.06⅝
Ray-Cal	lb.	.05⅝/	.06⅝
Rayox	lb.	.14 /	.17
Titanolith (5-ton lots)	lb.	.05⅝/	.05⅞
Titanox-A (50-lb. bags)	lb.	.14 /	.14¾
B (50-lb. bags)	lb.	.05⅝/	.05⅞
30 (50-lb. bags)	lb.	.05⅝/	.05⅞
C (50-lb. bags)	lb.	.05⅝/	.05⅞
M	lb.	.05⅝/	.05⅞
Ti-Tone	lb.		
Zinc Oxide			
Azo ZZZ-11	lb.	.0625/	.065
44	lb.	.0625/	.065
55	lb.	.0625/	.065
66	lb.	.0625/	.065
French Process, Florence			
White Seal-7 (bbls.)	lb.	.085 /	.0875
Green Seal-8	lb.	.08 /	.0825
Red Seal-9	lb.	.075 /	.0775
Kadox, Black Label-15	lb.	.065 /	.0675
No. 25	lb.	.075 /	.0775
Red Label-17	lb.	.065 /	.0675
Horse Head Special 3	lb.	.0625/	.065
XX Red-4	lb.	.0625/	.065
23	lb.	.0625/	.065
72	lb.	.0625/	.065
78	lb.	.0625/	.065
80	lb.	.0625/	.065
103	lb.	.0625/	.065
110	lb.	.0625/	.065
St. Joe (lead free)			
Black Label	lb.	.0625/	.065
Green Label	lb.	.0625/	.065
Red Label	lb.	.0625/	.065
U.S.P.	lb.	.095 /	.0975
White Jack	lb.	.07⅞/	.08¼
Zopaque	lb.	.14 /	.1475

YELLOW

Cadmolith (cadmium yellow), 400 lb. bbls.	lb.	.45	/ .50
Du Pont dispersed	lb.	1.25	/ 1.75
Powders	lb.	1.55	/ 1.37
Lemon	lb.		
Mapico	lb.	.0675	
Toners	lb.	2.50	

Dispersing Agents

Darvan	lb.	.30	/ .47
Nevoll (drums)	lb.	.0215	
Santomerse S	lb.	.11	/ .25

Fillers, Inert

Asbestine, c.l., f.o.b., mills	ton	15.00	
Barytes	ton	30.00	/36.00
f.o.b., St. Louis (50 lb. paper bags)	ton	22.85	
off color, domestic	ton	20.00	/25.00
white, imported	ton	29.00	/32.00
Blanc fixe, dry, precip.	lb.	.03	/ .035
Calcene	ton	37.50	/43.00
Infusorial earth	lb.	.02	/ .03
Kalite No. 1	ton	24.00	/50.00
3	ton	34.00	/60.00
Magnesia, calcined, heavy	lb.	.04	
Carbonate, l.c.l.	lb.	.07	/ .095
Pyrax A	ton	6.50	/20.00

Whiting			
Columbia Filler	ton	$9.00	/$14.00
Guilders	100 lbs.		
Hakuenka	lb.		
Paris white, English cliffstone	100 lbs.		
Southwark Brand, Commercial	100 lbs.		
All other grades	100 lbs.		
Suprex, white extra light	ton	45.00	/60.00
heavy	ton	45.00	/ 60.00
Witco, c.l.	ton	6.00	

Finishes

Rubber lacquer, clear	gal.		
colored	gal.		
Starch, corn, pwd.	100 lbs.		
potato	lb.		
Talc	ton	25.00	/45.00

Flock

Cotton flock, dark	lb.	.10	/ .12
dyed	lb.	.40	/ .80
white	lb.	.11	/ .18
Rayon flock, colored	lb.	1.15	/ 2.00
white	lb.	.75	/ 1.00

Latex Compounding Ingredients

Accelerator 85	lb.	.35	
89	lb.	1.40	
122	lb.	1.55	
552	lb.	2.50	
Aerosol	lb.	.45	
Antox, dispersed	lb.	.42	
Aquarex A	lb.	.35	
D	lb.	.75	
F	lb.	.85	
WA Paste	lb.	.25	
Areskap No. 50	lb.	.18	/ .24
100, dry	lb.	.39	/ .51
Aresket No. 240	lb.	.16	/ .22
300, dry	lb.	.42	/ .50
Aresklene No. 375	lb.	.35	/ .50
400, dry	lb.	.51	/ .65
Black No. 25, dispersed	lb.	.22	/ .40
Catalpo	ton		
Collocarb	lb.	.055	/ .07
Color Pastes, dispersed	lb.	.35	/ 1.90
Dispersex No. 15	lb.	.11	/ .12
No. 20	lb.	.08	/ .10
Emo, brown	lb.	.15	
white	lb.	.15	
Factice Compound, dispersed	lb.	.36	
Heliozone, dispersed	lb.	.25	
Igepon A	lb.		
MICRONEX, Colloidal	lb.	.055	/ .07
Nekal BX (dry)	lb.		
Palmol	lb.	.11	
Pipsol X	lb.	3.05	/ 3.55
R-2 Crystals	lb.	2.50	/ 2.75
R-23	lb.	.40	
R-N-2	lb.	1.40	/ 1.80
Crystals	lb.	2.00	/ 2.25
S.1 (400 lb. drums)	lb.	.65	
Santomerse D	lb.	.41	/ .65
S	lb.	.11	/ .25
No. 1	lb.	.18	/ .35
No. 2	lb.	.18	/ .35
No. 3	lb.	.40	/ .65
No. 3P	lb.	.29	/ .45
Santovar A	lb.	1.35	
Stablex A	lb.	.90	/ 1.10
B	lb.	.65	/ .90
C	lb.	.40	/ .50
Sulphur, dispersed	lb.	.10	/ .15
No. 2	lb.	.075	/ .15
T.1. (400 lb. drums)	lb.	.40	
Tepidone	lb.	1.45	
Vulcan Colors	lb.		
Zinc oxide, dispersed	lb.	.12	/ .15

Mineral Rubber

Black Diamond	ton	25.00	
Hydrocarbon, hard	ton	22.00	/42.00
Parmr	ton	22.00	/24.00
Pioneer	ton		
285°-300°	ton	22.00	/42.00

Mold Lubricants

Mold Paste	lb.	.12	/ .18
Sericite	ton	65.00	/75.00
Soapbark	lb.		
Soapstone	ton	25.00	/35.00

Oil Resistant

AXF	lb.	.40	/ .50

Reenforcers

Carbon Black			
Aerfloted Arrow Specification Black	lb.	.0275/	.0625
Arrow Compact Granulized Carbon Black	lb.	.0275/	.0625
"Certified" Heavy Compressed, Cabot	lb.		
Spheron	lb.		
Carbitum	ton	58.00	/63.00
Continental Dustless, c.l.	lb.	.0275/	.0375
Compressed c.l.	lb.	.0275/	.0375
Uncompressed, c.l.	lb.	.0275/	.0375
Disperso, c.l.	lb.	.0275/	.0375
Dixie, c.l., f.o.b. New Orleans, La., Galveston or Houston, Tex.	lb.	$0.0275	
c.l., delivered New York	lb.	.0375	
local stock, bags, delivered	lb.	.0625	
Dixiedensed, c.l., f.o.b., New Orleans, La., Galveston or Houston, Tex.	lb.	.0275	
c.l., delivered New York	lb.	.0375	
local stock, bags, delivered	lb.	.0625	
Dixiedensed, 66, c.l., f.o.b. New Orleans, La., Galveston or Houston, **Tex.**	lb.	.0275	
c.l., delivered New York	lb.	.0375	
local stock, bags, delivered	lb.	.0625	
Excello, c.l., f.o.b. Gulf ports	100 lbs.	3.10	/$5.10
delivered New York	100 lbs.	3.75	/ 5.75
l.c.l., delivered New York	100 lbs.	6.25	/ 7.00
Fumonex, c.l., f.o.b. works	lb.	.03	
ex-warehouse	lb.	.05	
Gastex	lb.	.03	/ .07
Kosmobile, c.l., f.o.b. New Orleans, La., Galveston or Houston, Tex.	lb.	.0275	
c.l., delivered New York	lb.	.0375	
local stock, bags, delivered	lb.	.0625	
Kosmobile 66, c.l., f.o.b. New Orleans, La., Galveston or Houston, **Tex.**	lb.	.0275	
c.l., delivered New York	lb.	.0375	
local stock, bags, delivered	lb.	.0625	
Kosmos, c.l., f.o.b. New Orleans, La., Galveston or Houston, Tex.	lb.	.0275	
c.l., delivered New York	lb.	.0375	
local stock, bags, delivered	lb.	.0625	
MICRONEX Beads, c.l., f.o.b. Gulf ports	lb.	.0275	
c.l., delivered, New York	lb.	.0375	
local stock, bags, delivered	lb.	.0625	
Mark II, c.l., f.o.b. Gulf ports	lb.	.0275	
c.l., delivered, New York	lb.	.0375	
local stock, bags, delivered	lb.	.0625	
Standard, c.l., f.o.b. Gulf ports	lb.	.0275	
c.l., delivered, New York	lb.	.0375	
local stock, bags, delivered	lb.	.0625	
W-5, c.l., f.o.b., Gulf ports	lb.	.0275	
c.l., delivered, New York	lb.	.0375	
local stock, bags, delivered	lb.	.0625	
W-6, c.l., f.o.b., Gulf ports	lb.	.0275	
c.l., delivered, New York	lb.	.0375	
local stock, bags, delivered	lb.	.0625	
Paradene No. 2 (drums)	lb.	.04	
Pelletex	lb.	.03	/ .07
Supreme, c.l., f.o.b. Gulf ports	100 lbs.	3.10	/ 5.10
delivered New York	100 lbs.	3.75	/ 5.75
l.c.l., delivered New York	100 lbs.	6.25	/ 7.00
"WYEX BLACK"	lb.	.0275/	.0625
Clays			
Aerfloted Paragon (50 lb. bags)	ton	9.50	/22.00
Suprex (50 lb. bags)	ton	9.50	/22.00
China	ton	17.50	/20.00
Crown, f.o.b. (plant)	ton	9.50	
Dixie	ton	11.00	/26.00
Junior	ton	9.50	/24.00
Hi-White, f.o.b. Huber **Ga.**	ton	9.50	
McNamee	ton	9.50	/22.00
Par	ton	9.50	/22.00
Witco, f.o.b. works	ton	9.50	
P-33	lb.	.0475/	.0775
Thermax	lb.	.0175/	.05
Velvetex	lb.	.022 /	.035

Reodorants

Amora A	lb.		
B	lb.		
C	lb.		
D	lb.		
Curodex 19	lb.	2.75	
188	lb.	3.50	
198	lb.	4.50	
Rodo No. 0	lb.	3.50	/ 4.00
10	lb.	4.50	/ 5.00

(*Continued on page 78*)

COTTON AND FABRICS

New York Quotations

June 22, 1939

Drills		
38-inch 2.00-yard	*yd.*	$0.10½
40-inch 3.47-yard		.06⅝
50-inch 1.52-yard		.15⅛
52-inch 1.85-yard		.12¾
52-inch 1.90-yard		.11¾
52-inch 2.70-yard		.11
52-inch 2.50-yard		.09¾
59-inch 1.85-yard		.12
Ducks		
38-inch 2.00-yard D.F.	*yd.*	.10½/.10¾
40-inch 1.45-yard S. F.		.15¼
51½-inch 1.35-yard D. F.		.15½
72-inch 1.05 yard D. F.		.20½/.21⅞
72-inch 17.21-ounce		.24
Mechanicals		
Hose and belting	*lb.*	.24½
Tennis		
52-inch 1.35-yard	*yd.*	.16½
Hollands		
Gold Seal and Eagle		
20-inch No. 72	*yd.*	.09
30-inch No. 72		.16
40-inch No. 72		.18
Red Seal and Cardinal		
20-inch	*yd.*	.07½
30-inch		.13¾
40-inch		.15
50-inch		.24
Osnaburgs		
40-inch 2.34-yard	*yd.*	.09
40-inch 2.48-yard		.08⅝
40-inch 2.56-yard		.08
40-inch 3.00-yard		.07⅛
40-inch 7-ounce part waste		.07⅛
40-inch 10-ounce part waste		.10
37-inch 2.42-yard		.08⅞
Raincoat Fabrics		
Cotton		
Bombazine 60 x 64	*yd.*	.07¼
Plaids 60 x 48		.11
Surface prints 60 x 64		.11½
Print cloth, 38½-inch, 60 x 64		.04½
Sheetings, 40-Inch		
48 x 48, 2.50-yard	*yd.*	.07¼
64 x 68, 3.15-yard		.06¾
56 x 60, 3.60-yard		.05⅝
44 x 40, 4.25-yard		.04½
Sheetings, 36-Inch		
48 x 48, 5.00-yard	*yd.*	.04¼
44 x 40, 6.15-yard		.03⅝
Tire Fabrics		
Builder		
17¼ ounce 60" 23/11 ply Karded peeler	*lb.*	.28
Chafer		
14 ounce 60" 20/8 ply Karded peeler	*lb.*	.28
9¼ ounce 60" 10/2 ply Karded peeler	*lb.*	.27
Cord Fabrics		
23/5/3 Karded peeler, 1 1/16" cotton	*lb.*	.28½
15/3/3 Karded peeler, 1 1/16" cotton	*lb.*	.26½
23/5/3 Karded peeler, 1¼" cotton	*lb.*	.34
23/5/3 Combed Egyptian	*lb.*	.47½
Leno Breaker		
8¼ ounce and 10¼ ounce 60" Karded peeler	*lb.*	.30

United States Latex Imports

Year	Pounds (d.r.c.)	Value
1937	51,934,040	$10,213,670
1938	26,606,048	4,147,318
1939		
Jan.	3,589,452	599,927
Feb.	3,844,996	657,565
Mar.	4,491,951	731,302
Apr.	2,279,171	360,739

Data from Leather and Rubber Division, United States Department of Commerce, Washington, D. C.

New York Cotton Exchange Week-End Closing Prices

Futures	Apr. 29	May 27	June 3	June 10	June 17	June 24
May	8.38	....	....	....	....	....
June	8.25	9.20	9.33	9.49	....	....
July	8.12	8.90	9.03	9.19	9.27	9.46
Sept.	7.79	8.43	8.35	8.42	8.55	8.87
Dec.	7.58	8.09	8.02	8.07	8.18	8.55
Mar.	7.56	7.98	7.89	7.89	7.99	8.35
May	....	7.98	7.86	7.83	7.92	8.28

THE accompanying table of week-end closing prices on the New York Cotton Exchange shows the week-end change of representative futures covering the past two months.

After closing at 9.70¢ per pound on June 1, the New York spot middling price rose to 10¢ per pound on June 8. Thereafter the price was somewhat easier, closing at 9.90¢ per pound on June 22. The closing price on June 24 was 9.97¢, on June 26, 9.91¢, and on June 27, 9.97¢.

According to the Census Bureau, cotton consumed in domestic mills during May totaled 605,353 bales of lint and 73,622 bales of linters, compared with 546,702 and 69,147 in April and 426,149 and 60,381 in May, 1938. Exports, exclusive of linters, amounted to 142,577 bales in May, against 178,225 in April and 193,002 in May, 1938. Domestic mill consumption in May was exceeded only twice in the last ten years, once each in 1937 and 1933.

The United States has called an international conference of cotton-exporting countries to discuss the possibility of world-wide control of production and marketing, to be held in Washington beginning September 5.

The uncertainty of the outcome of cotton legislation was largely removed on June 22 when the House accepted the Senate's unbudgeted $338,000,000 for farm aid. Of the $225,000,000 earmarked for parity payments, one-fourth would be payable to cooperating cotton farmers in 1940. No limitations are imposed on these parity payments. One-fourth of the $113,000,000 appropriation for removal of farm surpluses would be available for cotton. The highly controversial cotton export subsidy plan was settled by a compromise which provides that 50% of the cotton surplus removal money be expended in this country, leaving $14,000,000 for the export subsidy. This amount together with $22,500,000 already available from previously enacted farm law provisions would make a total of $36,500,000 available for subsidizing cotton exports.

Fabrics

The demand for cotton textiles of coarse yarn construction became more active during the first half of June with reports of substantial buying of all types of goods. A period of digestion followed this activity, but the market retained its firmness. The raincoat business is said to be much improved, and a number of large orders for men's raincoats have been received, it is stated.

The market is firm, with the prices of drills, ducks, sheetings, and raincoat fabrics showing fractional advances over last month's levels. Tire fabrics all moved up ½¢ per pound; while Hollands were unchanged. Osnaburgs were mainly steady with only two types showing price increases.

Cotton-Rubber Exchange Agreement Signed

The governments of Great Britain and the United States signed on June 23 an agreement whereby governmental departments of the United States are to supply 600,000 bales of raw cotton to the British government, which in turn will procure and furnish to the United States government rubber to an equal value. Grades of the materials are to be specified by the receiving governments. Samples of the cotton will be made available for inspection during a period of six months beginning fifteen days after entry into force of this agreement. The rubber will be made available for inspection within six months beginning at a date to be agreed upon by both governments. Delivery of both on board ship is to be made within fifteen days after inspection and acceptance.

The price of cotton will be fixed on the basis of the average market price as published by the Bureau of Agricultural Economics for middling ⅞-inch cotton during the period January 1-June 23, 1939, for spot delivery at New Orleans, plus 0.24¢ per pound for cost of handling with relative adjustments for other grades and staples. The equivalent quantity of rubber will be calculated upon the average market price, as published by the Department of Statistics in the Straits Settlements for No. 1 ribbed, smoked sheets, during the period January 1-June 23, 1939, for spot delivery at Singapore plus $0.25¢ per pound for handling with relative adjustments for other grades.

Unless a major war emergency arises, both governments agree to hold this stock for a minimum period of seven years except as rotation may be necessary to prevent loss through deterioration, and after that period it can be liquidated only after consulting the other government and taking all steps to avoid disturbance of the markets.

It must be remembered that this agreement cannot become effective until: approved in treaty form by a two-thirds vote of the U. S. Senate; enabling legislation is passed to provide for the details of carrying out the arrangement; and arrangements are consummated with the International Rubber Regulation Committee to raise the quota so as to make a sufficient quantity of rubber available. It is estimated that approximately 85,000 tons of rubber at a value of about $30,000,000 will be involved.

RECLAIMED RUBBER

United States Reclaimed Rubber Statistics—Long Tons

Year	Production	Consumption†	Consumption % to Crude	U. S. Stocks*	Exports
1937	185,033	162,000	29.8	28,800	13,233
1938	122,403	120,800	27.6	23,000	7,403
1939					
Jan.	14,826	13,743	29.7	23,334	748
Feb.	14,102	13,347	31.5	23,461	630
Mar.	15,647	16,197	32.3	22,155	756
Apr.	14,527	13,391	30.3	22,628	748
May	14,769	13,517	30.5	22,771	...

*Stocks on hand the last of the month or year. †Corrected to 100% from estimate of reported coverage.
Compiled by The Rubber Manufacturers Association, Inc.

U. S. Crude and Waste Rubber Imports for 1939

	Plantations	Latex	Paras	Africans	Centrals	Guayule	Totals 1939	Totals 1938	Balata	Miscellaneous	Waste
Jan. ....tons	36,672	1,521	560	56	9	264	39,082	42,135	61	803	328
Feb.	34,185	1,463	239	348	3	252	36,490	43,930	45	685	54
Mar.	36,434	1,885	229	208	4	229	38,989	35,967	33	649	29
Apr.	27,991	784	487	142	1	196	29,601	30,807	65	275	246
May	44,015	2,167	413	761	7	172	47,535	27,410	78	759	151
Total 5 mos., 1939 ......tons	179,297	7,820	1,928	1,515	24	1,113	191,697	......	282	3,171	808
Total 5 mos., 1938 ......tons	171,334	4,906	1,754	931	8	1,316	......	180,249	218	3,582	161

Compiled from The Rubber Manufacturers Association, Inc., statistics.

Rims Approved by The Tire & Rim Association, Inc.

Rim Size	3 Mos., 1939 No.	3 Mos., 1939 %	3 Mos., 1938 No.	3 Mos., 1938 %
Drop Center Rims, 16" Diameter and Under				
16x4.00D	16,268	0.4	3,227	0.2
16x4.50D	487	0.0	......	...
15x5.50E	151	0.0	......	...
15x3.00D	44,068	1.1	13,019	1.0
15x5.00F	34,770	0.9	......	...
15x5.50F	48,147	1.3	28,690	2.1
16x3.50D	86,369	2.2	123,828	9.0
16x4.00E	2,241,346	57.3	767,695	55.8
16x4.25E	319,901	8.2	43,914	3.2
16x4.50E	784,809	20.1	231,395	16.8
16x5.00F	300,383	7.7	85,121	6.2
16x5.50F	2,707	0.1	53,978	3.9
16x6.00F	8,786	0.2	5,882	0.4
Drop Center Rims, 17" Diameter and Over				
17x3.00D	93	0.0	......	...
17x3.25E	......	...	2,507	0.2
17x3.62F	3,590	0.1	......	...
17x5.00F	215	0.0	167	0.0
18x2.15B	7,411	0.2	2,942	0.2
18x3.00D	1,123	0.0	712	0.1
18x3.25E	433	0.0	1,054	0.1
18x3.62F	5,330	0.1	4,547	0.3
18x4.00F	326	0.0	......	...
18x4.19F	......	...	2,513	0.2
19x3.25E	1,612	0.0	......	...
20x3.25E	2,196	0.1	1,707	0.1
21x3.25E	1,556	0.0	805	0.1
Flat Base Passenger Rims				
All Sizes	1,238	0.0	357	0.0
High Pressure Passenger Rims				
All Sizes	......	...	232	0.0
15" Truck Rims				
15x7	757	0.1	944	0.2
15x8	......	...	631	0.2
17" Truck Rims				
17x5	15,655	1.9	37,149	10.4
17x6	11,198	1.3	10,058	2.8
18" Truck Rims				
18x7	3,269	0.4	5,865	1.6
18x8	1,812	0.2	4,553	1.3
18x9/10	1,679	0.2	1,125	0.3
20" Truck Rims				
20x5	163,207	19.6	53,307	15.0
20x6	358,153	43.1	148,255	41.5
20x7	158,586	19.1	52,094	14.6
20x8	43,556	5.2	10,181	2.8
20x9/10	6,232	0.8	6,365	1.9
20x11	620	0.1	1,072	0.3

Rim Size	3 Mos., 1939 No.	3 Mos., 1939 %	3 Mos., 1938 No.	3 Mos., 1938 %
22" Truck Rims				
22x7	310	0.0	......	...
22x8	2,170	0.3	2,647	0.7
22x9/10	1,531	0.2	402	0.1
24" Truck Rims				
24x6	1,131	0.1	388	0.1
24x7	456	0.1	858	0.2
24x8	1,613	0.2	2,448	0.7
24x9/10	2,241	0.3	2,050	0.6
24x11	1,855	0.2	541	0.1
16" Semi Drop Center Rims				
16x4.50E	21,175	2.5	6,119	1.7
16x5.50F	34,250	4.1	10,572	3.0
Tractor and Implement Rims				
12x2.50C	1,169	0.8	......	...
12x3.00D	2,710	1.9	2,057	1.6
13x5.50F	709	0.5	......	...
15x3.00D	5,634	4.0	3,253	2.6
16x3.00D	959	0.7	532	0.4
16x6.00F	......	...	6,643	5.2
18x3.00D	579	0.4	777	0.6
18x5.50F	4,077	2.9	1,799	1.4
20x4.50E	1,173	0.8	753	0.6
20x5.50F	704	0.5	3,862	3.0
21x3.00D	672	0.5	370	0.3
22x4.50E	4,036	2.9	1,158	0.9
24x3.00D	10	0.0	......	...
28x4.00E	63	0.0	44	0.0
36x3.00D	......	...	495	0.4
36x4.00E	87	0.1	......	...
36x4.50E	2,687	1.9	......	...
40x3.00D	51	0.0	......	...
40x4.50E	184	0.1	......	...
44x4.00E	38	0.0	......	...
44x4.50E	205	0.1	......	...
24x5.50R	5,243	3.7	8,208	6.5
32x5.50R	......	...	11	0.0
36x5.50R	4,349	3.1	624	0.5
40x5.50R	2,717	1.9	3,558	2.8
20x8.00T	......	...	156	0.1
24x6.00S	2,618	1.9	2,308	1.8
24x8.00T	23,767	16.9	25,094	19.8
28x6.00S	785	0.5	576	0.4
28x8.00T	9,015	6.4	11,853	9.3
32x8.00T	3,725	2.6	1,421	1.1
36x6.00S	16,299	11.5	18,015	14.2
36x8.00T	36,804	26.1	28,555	22.5
40x6.00S	9,032	6.4	4,886	3.8
40x8.00T	882	0.6	......	...
42x8.00T	21	0.0	......	...
44x8.00T	......	...	52	0.0

Rim Size	3 Mos., 1939 No.	3 Mos., 1939 %	3 Mos., 1938 No.	3 Mos., 1938 %
Cast Rims				
10x5.00F	103	21.8	495	89.3
10x6.00F	255	53.9	35	6.3
24x15	115	24.3	24	4.3
Airplane Rims				
All Sizes	635	0.0	......	...
Totals	4,886,883		1,859,530	

ACCORDING to the R. M. A., May reclaimed rubber consumption is estimated at 13,517 long tons, 0.9% above that of April; production at 14,769 long tons; and stocks on hand May 31, 22,771 long tons. The demand for reclaim during June continued at approximately the preceding month's level of activity. Demand originating from tire and mechanical goods business was reported as being good.

The market continues steady, with prices at levels long in force.

New York Quotations

June 21, 1939

	Sp. Grav.	¢ per lb.
Auto Tire		
Black Select	1.16-1.18	6 / 6¼
Acid	1.18-1.22	7 / 7¼
Shoe		
Standard	1.56-1.60	6½/ 6¾
Tubes		
No. 1 Floating	1.00	12 /12¼
Compound	1.10-1.20	8 / 8¼
Red Tube	1.15-1.30	8 / 8¼
Miscellaneous		
Mechanical Blends	1.25-1.50	4½/ 5
White	1.35-1.50	11½/12

The above list includes those items or classes only that determine the price basis of all derivative reclaim grades. Every manufacturer produces a variety of special reclaims in each general group separately featuring characteristic properties of quality, workability, and gravity at special prices.

Tire Production Statistics

	Pneumatic Casings Inventory	Production	Shipments
1937	10,383,235	53,309,973	53,485,388
1938	8,451,390	40,182,392	42,330,072
1939			
Jan.	8,932,245	4,581,380	4,163,005
Feb.	9,572,553	4,343,513	3,738,696
Mar.	10,108,584	5,137,030	4,582,655
Apr.	9,997,527	4,211,152	4,355,584

	Pneumatic Casings Original Equipment	Replacement Sales	Export Sales
1937	22,352,601	29,886,326	1,246,461
1938	10,716,130	30,565,008	1,048,934
1939			
Jan.	1,685,190	2,353,822	123,993
Feb.	1,472,356	2,159,901	106,439
Mar.	1,746,999	2,719,450	116,206
Apr.	1,528,637	2,736,155	90,792

	Inner Tubes Inventory	Production	Shipments
1937	10,311,745	52,373,330	52,766,728
1938	8,165,696	37,847,656	40,292,614
1939			
Jan.	8,068,700	4,097,759	3,935,652
Feb.	8,414,652	3,680,521	3,334,791
Mar.	8,900,944	4,470,184	4,015,333
Apr.	8,837,313	3,841,304	3,927,033

Source: The Rubber Manufacturers Association, Inc. Figures adjusted to represent 100% of the industry.

CLASSIFIED ADVERTISEMENTS

ALL CLASSIFIED ADVERTISING MUST BE PAID IN ADVANCE

GENERAL RATES	SITUATIONS WANTED RATES	SITUATIONS OPEN RATES
Light face type $1.00 per line (ten words)	Light face type 40c per line (ten words)	Light face type 75c per line (ten words)
Bold face type $1.25 per line (eight words)	Bold face type 55c per line (eight words)	Bold face type $1.00 per line (eight words)

Allow nine words for keyed address. *Replies forwarded without charge.*

SITUATIONS WANTED

MANAGER OR SUPERINTENDENT PREFERRED. 15 YEARS' experience as manager in Druggists' Sundries, Molded Mechanical Goods, estimating, production, purchasing; and foremanship for three years. Would accept any position providing good chances for advancement. Address Box No. 2, care of INDIA RUBBER WORLD.

FACTORY MANAGER—AT PRESENT EMPLOYED—WIDE EXperience tires and tubes, molded goods, coated fabrics and upholstery. Thermo-plastics, cements and seaming compounds. Will consider change to well-financed, progressive company. Address Box No. 4, care of INDIA RUBBER WORLD.

18 YEARS' EXPERIENCE RUNNING A MECHANICAL RUBBER plant. Man thoroughly familiar with development, compounding, manufacturing processes, chemistry, cost estimates, etc., age 41, married, college graduate, seeks responsible position or partnership with a rubber plant. Address Box No. 5, care of INDIA RUBBER WORLD.

CHEMIST—EXPERIENCE IN TECHNICAL SALES OF RUBBER chemicals and colors; and in analytical, development and research work in rubber and reclaim laboratories; also laboratory and production control of various chemicals. Age 42; married; references. Address Box No. 6, care of INDIA RUBBER WORLD.

PRODUCTION MANAGER, NOW EMPLOYED, DESIRES CHANGE. Thoroughly familiar with development, compounding for and production of mechanical, synthetic rubber, or sponge rubber products. Age 39. Well educated. Practical experience with major concerns. Capable as technical superintendent. Address Box No. 8, care of INDIA RUBBER WORLD.

SITUATIONS OPEN

$2,500 SALARIED POSITION $15,000
OUR SYSTEM OF SEARCHING OUT SALARIED POSITIONS, hiding your identity, increases your salary commensurate with training and experience. For valuable information write Rubber Department, EXECUTIVE'S PROMOTION SERVICE, Washington, D. C.

RUBBER PLANT NEAR NEW YORK, CAPACITY ABOUT $400,000 yearly, requires services thoroughly experienced plant superintendent and chemist, must have thorough knowledge modern and economical production and trimming methods, molded specialties, principally plumbing, electrical and mechanical items. In addition to salary will share in profits. Excellent opportunity. State experience in complete detail. Address Box No. 7, care of INDIA RUBBER WORLD.

BUSINESS OPPORTUNITY

CUSTOM MILLING—EXPERT COMPOUNDING AND PROCESSING work for all requirements. The Honey Company, P. O. Box 453, Trenton, N. J.

FOSTER D. SNELL, INC.
Chemists—Engineers
Every form of Chemical Service
305 Washington Street **Brooklyn, N. Y.**

Deresinated and Precipitated Surinam
BALATA
Refined approximately 99%
Purer and cheaper than you can produce it and you avoid the ever present fire risk. Dependable deliveries. Sample on request.
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SOLE PRODUCERS
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"Rubber—Physical and Chemical Properties"
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We grant exclusive license for novel article in rubber soled footwear, patented in U. S. A., which is already manufactured in most European countries. Especially interesting for rubber factories not yet manufacturing rubber footwear. Cost of installation very low allowing very big turn over. Please write for information to **Box No. 3, care of**
INDIA RUBBER WORLD

AN APPROVED CLAY
CROWN CLAY
SOUTHEASTERN CLAY COMPANY
AIKEN, SOUTH CAROLINA

(*Advertisements continued on page 79*)

Rubber Trade Inquiries

The inquiries that follow have already been answered; nevertheless they are of interest not only in showing the needs of the trade, but because of the possibility that additional information may be furnished by those who read them. The Editor is therefore glad to have those interested communicate with him.

No.	Inquiry
2644	Manufacturers of sponge rubber for upholstery purposes.
2645	Manufacturers of sponge sundries, as shoe cleaners, etc.
2646	Manufacturer of "Eccles Machine" to build hollow articles.
2647	Manufacturer of inexpensive bath mats.
2648	Information wanted on and formula for a heavy rubber solution for sticking rubber bands to glass.
2649	Manufacturers of chain-conveyer type of equipment for the production of rubber footwear.
2650	Manufacturers of molded or extruded eraser rubber.
2651	Suppliers of rubber treated paper for waterproof bags.

New York Quotations

(*Continued from page 72*)

Rubber Substitutes			
Black	lb.	$.07	/$0.11
Brown	lb.	.07	/ .095
White	lb	.0775	/ .11
Factice			
Amberex	lb.	.17	
Brown	lb.	.07	/ .10
Fac-Cel B	lb.	.12	
C	lb.	.12	
Neophax A	lb.	.0925	
B	lb.	.0925	
White	lb.	.08	/ .115
Softeners			
Bondogen	lb.	.98	/ 1.50
Burgundy pitch	lb.	.06	
Cycline oil	gal.	.14	/ .20
Nuba resinous pitch (drums) Grades No. 1 and No. 2	lb.	.0265	
Nubalene Resin	lb.	.025	
Palm oil (Witco), c.l.	lb.	.0575	
Pine tar	gal.		
Plastogen	lb.	.0775	/ .12
R-19 Resin (drums)	lb.	.10	
R-21 Resin (drums)	lb.	.10	
Reogen	lb.	.115	/ .26
Rosin oil, compounded	gal.	.40	
RPA No. 1	lb.	.65	
2	lb.	.65	
3	lb.	.46	
Rubtack	lb.	.10	
Tackol	lb.	.085	/ .18
Tonox	lb.	.52	/ .61
Tonox D	lb.	.75	/ .85
Witco No. 20	gal.	.20	
X-1 Resinous oil (tank car)	lb.	.019	
Solvents			
Beta-Trichlorethane	gal.		
Carbon bisulphide	lb.		
tetrachloride	lb.		
Industrial 90% benzol (tank car)	gal.	.16	
Skellysolve	gal.		
Stabilizers for Cure			
Laurex, ton lots	lb.	.105	/ .13
Stearex B	lb.	.10	/ .11
Beads	lb.	.09	/ .10
Stearic acid, single pressed	lb.	.10	/ .11
Stearite	100 lbs.	.09	
Zinc stearate	lb.	.23	
Synthetic Rubber			
Neoprene Type E	lb.	.65	
G	lb.	.70	
GW	lb.	.75	
H	lb.	.78	
M	lb.	.65	
Latex Type 57	lb.	.30	
Varnish			
Shoe	gal.	1.45	
Vulcanizing Ingredients			
Sulphur			
Chloride, drums	lb.	.035	/ .04
Rubber	100 lbs.	2.65	
Telloy	lb.	1.75	
Vandex	lb.	1.75	
(See also Colors—Antimony)			
Waxes			
Carnauba, No. 3 chalky	lb.	.37½	
2 N.C.	lb.	.39¾	
3 N.C.	lb.	.37½	
1 Yellow	lb.	.4575	
2	lb.	.4425	
Montan, crude	lb.	.11	

Book Reviews

(*Continued from page 63*)

have been prepared by H. J. Jordan for the chapter on viscosity effects in living protoplasm and in muscles. An index has been added to the volume.

The subject matter which covers the same ground as the first edition deals with: basic theoretical concepts involved in the processes of deformation; experimental investigation of flow properties; technique of viscosity measurements; technical aspects of viscosity and plasticity, including a discussion on rubber; plastic deformation of crystalline substances; and viscosity effects related to biology.

"Physical Constants of Hydrocarbons. Volume I. Paraffins, Olefins, Acetylenes, and Other Aliphatic Hydrocarbons." Gustav Egloff. American Chemical Society Monograph Series. No. 78. Published by Reinhold Publishing Corp., 330 W. 42nd St., New York, N. Y. 1939. Cloth, 6 by 9 inches, 416 pages. Four-Volume Series. Price $9 for Volume 1.

This first volume deals with the paraffins, olefins, acetylenes, and other aliphatic hydrocarbons. In each section the compounds are listed in order of increasing number of carbon atoms. Owing to its simplicity and consistency, the Geneva system of nomenclature has been used throughout. The data are arranged in tabular form, the first column designating the name and carbon skeleton of the hydrocarbon. A critical digest of this type is of recognized importance to all workers in hydrocarbon chemistry.

Belgium

(*Continued from page 61*)

duced there are said to have a good reputation in Germany. As to the French branch, uncertain conditions there have retarded building operations, but it is expected that the factory under construction will be completed this year.

At the International Rubber Conference in Liege on June 15, under the auspices of the Belgian Association of Rubber Technologists in connection with the Exposition Internationale de l'Eau, various papers on rubber and plastics were read, including: "Variations in Abrasion Measurements with the Grasselli," R. Campredon; "Gas Masks," G. Thiollet; "New Methods for the Physical Testing of Rubber," Dr. Roelig; "Applications of the Manometric Methods of Measuring Oxidizability of Rubber—Oxidation and Aging in the Geer Oven," Ch. Dufraisse and J. Le Bras; "Some Scientific Views of the Vulcanization of Rubber," A. van Rossem; "Electrical Properties of Rubber and Synthetic Plastics—Industrial Applications," M. Chevassus; "Development of Plastics in Germany during the Last Ten Years," R. Lepsius; "Plastics," M. Schwartz.

British Malaya

An official cable from Singapore to the Malayan Information Agency, Malaya House, 57 Trafalgar Sq., London, W.C.2, England, gives the following figures for May, 1939:

Rubber Gross Exports: Ocean Shipments from Singapore, Penang, Malacca, and Port Swettenham.

To	Sheet and Crepe Rubber Tons	Latex, Concentrated Latex, Revertex, and Other Forms of Latex Tons
United Kingdom	7,210	454
United States	18,612	847
Continent of Europe	5,600	408
British possessions	5,017	41
Japan	2,706	15
Other countries	1,293	11
Totals	40,438	1,776

Rubber Imports: Actual, by Land and Sea

From	Dry Rubber Tons	Wet Rubber (Dry Weight) Tons
Sumatra	5,208	72
Dutch Borneo	1,317	..
Java and other Dutch islands	115	..
Sarawak	1,820	..
British Borneo	204	25
Burma	413	5
Siam	2,459	489
French Indo-China	337	141
Other countries	89	3
Totals	11,962	735

Foreign Trade Information

For further information concerning the inquiries listed below address United States Department of Commerce, Bureau of Foreign and Domestic Commerce, Room 734, Custom House, New York, N. Y.

No.	Commodity	City and Country
*1989	Automobile accessories and parts	Shanghai, China
¶1990	Airplane accessories	London, England
†1991	Trailers and carts with pneumatic tires	Nakuru, Africa
*1992	Druggists' sundries	Cairo, Egypt
‡2053	Rubber toys and fountain pens	Rio de Janeiro, Brazil
*2074	Garters and suspenders.	Johannesburg, South Africa
‡2085	Sporting goods	Singapore, Straits Settlements
‡2087	Office and school supplies and fountain pens	Jaffa, Palestine
‡2100	Elastic materials	Melbourne, Australia
*2107	Auto accessories and parts	Sydney, Australia
*2146	Syringes, hot water bags, ice bags, and tubing	Guatemala City, Guatemala
‡2149	Sport articles, games, and toys	Brussels, Belgium
*2157	Balloons, rubber toys, and fountain pens	Bombay, India
‡2175	Foam and sponge rubber for furniture upholstery	Johannesburg, South Africa
*2195	Auto accessories and parts	London, England
†2247	Rubber-marking machine	Birmingham, England
*2200	Sporting goods	Manila, Philippine Islands
†2272	Rubber sundries	Rio de Janeiro, Brazil
*2273	Novelties, fountain pens, and toys	London, Canada
*2275	Elastic for garment trade	Toronto, Canada
†2298	Elastic webbing	Capetown, South Africa
†2301	Druggists' dipped rubber goods	Stockholm, Sweden

*Agency. †Purchase. ‡Purchase and agency. ¶Purchase or agency.

Classified Advertisements

Continued

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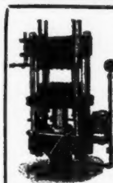

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Germany

(*Continued from page 66*)

ingen-Höhscheid.

675,502. **Motor Vehicle Suspension.** Continental Gummi-Werke A.G., Hannover.

TRADE MARKS

United States

366,743. Oval showing representation of a star and the word: **"Brigadier."** Tires. General Tire & Rubber Co., Akron, O.

366,751. **Santocure.** Accelerator. Monsanto Chemical Co., St. Louis, Mo.

366,882. **Ruglyde.** Lubricant. F. Rosen, doing business as American Grease Stick Co., Muskegon Heights, Mich.

366,885. **Plastex.** Wire and cable. Simplex Wire & Cable Co., Cambridge, Mass.

366,937. **Triumph.** Tires. Firestone Tire & Rubber Co., Akron, O.

366,940. **Kamper.** Soles. Panther-Panco Rubber Co., Inc., Chelsea, Mass.

366,948. **Drywear.** Baby pants, bibs, and bathing caps. Seiberling Latex Products Co., Barberton, O.

366,959. **Surety Turn-Cuff.** Gloves Surety Rubber Co., Carrollton, O.

366,967. **Stasnug.** Girdles, brassieres, etc. Imperial Mfg. Co., New York, N. Y.

366,968. **Stanzoil.** Rubber gloves. Pioneer Rubber Co., Willard, O.

366,972. **Bust Mold Specialized Sizing.** Girdles, brassieres, etc. Mold Form Brassiere, Inc., New York, N. Y.

366,988. **Mitzi Morgan.** Corsets. Neusteter Co., Denver, Colo.

367,008. Representation of a circle and the words: **"Honor Maid."** Girdles, garter belts, brassieres, etc. Honor Maid Negligee Co., Inc., New York.

367,030. **Speedway.** Heels. Goodyear Tire & Rubber Co., Akron, O.

367,031. **Slim Jim.** Combs. New York Hamburger Gummi-Waaren Co., Hamburg, Germany.

367,035. **Draco.** Belting. Drake Supply Co., Los Angeles, Calif.

367,040. **Sym-Belle Foundations.** Corselets, brassieres, etc. Even-Pul Foundations, New York, N. Y.

367,048. **Tawps.** Heels and soles. Goodyear Tire & Rubber Co., Akron, O.

367,060. **Sealtak.** Tape. Van Cleef Bros., Chicago, Ill.

367,110. **Dex-O-Tex.** Plastic flooring composition. Crossfield Products Corp., Los Angeles, Calif.

367,119. **Fixies.** Girdles, etc. H. W. Gossard Co., Chicago, Ill.

367,123. Circle showing representation of an automobile and the words: **"Uncle Don's Puddle Jumper."** Raincoats, ponchos, and footwear. D. Carney, New York, N. Y.

367,129. **Norol.** Elastic webbing. American Mills Co., New Haven, Conn.

367,133. **Ebonettes.** Gloves. Pioneer Rubber Co., Willard, O.

367,138. **Vogue Mis-Chief Foundation.** Brassieres, corsets, etc. Vogue Mfg. Co., Newark, N. J.

367,151. **Trail-Maker.** Shoes. Saco-Moc Shoe Corp., Portland, Me.

367,165. **"Three Pals."** Girdles and corsets. I. B. Kleinert Rubber Co., New York, N. Y.

367,201. **Idol.** Brassieres, corsets, etc. Idol Associated Mills, Inc., New York, N. Y.

367,204. **Playpron.** Latex aprons. International Latex Corp., Dover, Del.

367,211. **Tysonite.** Vulcanized oil for rubber compounding and wire insulation. Tyson Corp., Woodbridge, N. J.

367,325. **Shur-tred.** Liquid polish for rubber floors, etc. S. C. Johnson & Son, Inc., Racine, Wis.

367,329. **Firestone Champion.** Tires. Firestone Tire & Rubber Co., Akron, O.

367,330. **Rayodipt.** Tires. Firestone Tire & Rubber Co., Akron, O.

367,338. **Tempered Rubber.** Electrical wire. United States Rubber Products, Inc., New York, N. Y., assignor to United States Rubber Co., New York, N. Y.

367,370. Label containing representation of an archer and the word: **'Firestone."** Bicycles and structural parts thereof. Firestone Tire & Rubber Co., Akron, O.

367,395. **Plio Ribbon.** Rubber hydrohalide ribbon, and more particularly rubber hydrochloride. Freydberg Bros., Inc., Stamford, Conn.

367,413. **Evertex.** Elastic fabrics. Granby Elastic Web, Ltd., Granby, P. Q., Canada.

367,479. Representation of a label with diagonal lines containing the words: **"Po-Do."** Golf balls. Walgreen Co., Chicago, Ill.

367,481. Representation of a label containing the word: **"Insurance."** Fountain pens. G. Kapp, New York, N. Y.

367,483. Representation of a kneeling woman holding bubbles containing the words: **"Royal Foam Sponge."** Mattresses or cushions. United States Rubber Co., New York, N. Y.

367,504. **Flemco.** Linotype keyboard rubber roll. Birmingham Printing Co., Birmingham, Ala.

367,527. **Trico-5 Ply.** Windshield wiper blades. Trico Products Corp., Buffalo, N. Y.

World Net Imports of Crude Rubber

Year	U.S.A.	U.K.†	Australia	Belgium	Canada	Czecho-Slovakia	France	Germany	Italy	Japan	U.S.S.R.	Rest of the World	Total
1936	475,500	61,800	14,400	9,600	27,900	8,800	56,800	71,800	16,000	61,700	31,000	65,700	831,800
1937	592,500	135,900	19,300	15,000	36,100	13,000	60,000	98,200	24,000	62,200	30,400	78,800	1,120,500
1938	406,330	168,283	12,309	11,310	25,696	9,936	58,148	90,200	28,170	46,307	25,649*	80,427	926,645
1939													
Jan.	36,614	7,121	954	898	2,867	1,131	4,694	7,227	2,133	2,553	4,000*	6,718	70,625
Feb.	30,578	8,087	1,785	1,068	1,451	524	5,327	7,569	2,025	3,263	1,000*	7,155	66,518
Mar.	45,286	12,092	1,324	1,242	2,458	883	4,503	8,036	1,525	4,019	2,000*	7,183	86,541

*Estimated. †U. K. figures show gross imports, not net imports. Source: *Statistical Bulletin of the International Rubber Regulation Committee.*

Shipments of Crude Rubber from Producing Countries

Year	Malaya including Brunei and Labuan	N.E.I.	Ceylon	India	Burma	North Borneo	Sarawak	Siam	French Indo-China	Total	Philippines and Oceania	Liberia†	Other Africa	South America	Mexican Guayule	Grand Total
1936......	353,700	309,600	49,700	8,600	5,800	8,200	21,000	34,600	40,800	832,000	1,600*	1,600	6,800	14,600	1,300	857,900
1937......	469,900	431,700	70,400	9,800	7,200	13,200	25,900	35,600	43,400	1,107,100	1,600*	2,300	9,100	16,300	3,400	1,139,800
1938......	372,046	298,112	49,528	8,459	6,737	9,512	17,792	41,618	59,156	862,952	1,971*	2,929	9,000*	15,337	2,758	894,947
1938																
Jan.	30,998	26,468	5,222	841	538	1,307	3,485	2,897	6,139	77,895	138	501	750*	938	117	80,339
Feb.	37,166	27,327	5,216	639	770	918	8	3,266	3,089	78,399	125	168	750*	1,640	96	81,178
Mar.	33,567	31,270	3,834	532	703	853	1,564	2,837	3,268	78,428	159	108	750*	1,883	696	82,024
Apr.	44,744	28,489	1,951	485	842	1,158	1,728	1,583	3,708	84,688	201	308	750*	1,085	203	87,235
May	28,011	22,039	2,833	909	561	815	1,648	2,507	3,178	62,501	120	175	750*	1,160	446	65,152
June	28,048	24,427	3,693	625	693	643	2,441	3,904	4,854	69,328	198	110	750*	809	...	71,195
July	25,055	35,142	3,861	601	482	937	2,057	4,710	5,227	78,072	126	311	750*	722	227	80,208
Aug.	33,618	23,057	4,401	647	306	728	965	4,793	3,880	72,395	204	125	750*	1,118	620	75,212
Sept.	30,485	20,207	3,990	824	212	,284	756	3,893	8,200	68,851	208	445	750*	828	130	71,212
Oct.	25,788	29,883	4,893	832	279	1,075	1,612	4,976	3,663	73,001	128	222	750*	1,650	128	75,879
Nov.	29,214	19,195	6,422	670	601	567	929	3,223	4,064	64,885	164	274	750*	1,229	68	67,370
Dec.	25,352	10,608	3,212	854	750	227	599	3,029	9,886	54,509	200	182	750*	2,275	27	57,943
1939																
Jan.	24,393	38,678	7,237	764	1,115	1,604	2,342	2,918	4,739	83,790	220	528	800	1,812	281†	87,431
Feb.	29,278	24,996	5,495	947	618	664	1,484	5,606	5,659	74,747	158	435	800	1,187	262†	77,589
Mar.	29,298	27,934	3,718	774	619	344	1,177	5,401	3,907	73,172	230	427	800	1,407	274†	76,310
Apr.	29,789	28,311	2,176	892	379	1,687	2,446	2,660	2,562	70,902	200*	400*	800	1,206	250*	73,758

*Estimated. †Guayule rubber imports into U.S.A. and Germany provisional until export figures from Mexico are received. Source: *Statistical Bulletin of the International Rubber Regulation Committee.*

United States Statistics

Imports for Consumption of Crude and Manufactured Rubber

	April, 1939		Four Months Ended April, 1939	
UNMANUFACTURED—*Free*	Quantity	Value	Quantity	Value
Liquid latex (solids) ..... *lb.*	2,279,171	$360,739	14,205,570	$2,349,533
Jelutong or pontianak .... *lb.*	629,155	72,024	5,095,345	541,615
Balata .... *lb.*	131,784	18,170	334,816	48,228
Gutta percha .... *lb.*	279,303	31,664	1,000,889	143,619
Guayule .... *lb.*	396,400	24,584	1,887,900	160,260
Scrap and reclaimed ..... *lb.*	885,148	31,185	3,213,283	67,197
Totals	4,600,961	$538,366	25,737,803	$3,310,452
Misc. rubber (above). 1,000 *lbs.*	4,601	$538,366	25,738	$3,310,452
Crude rubber ...... 1,000 *lbs.*	69,073	10,400,125	310,666	48,040,634
Totals .... 1,000 *lbs.*	73,674	$10,938,491	336,404	$51,351,086
Chicle, crude .... *lb.*	1,631,070	$604,838	9,194,307	$3,175,252
MANUFACTURED—*Dutiable*				
Rubber tires .... *no.*	3,281	$22,647	7,806	$35,336
Rubber boots, shoes, and overshoes .... *prs.*	204	368	3,488	1,260
Rubber soled footwear with fabric uppers .... *prs.*	50,364	11,330	228,387	44,357
Golf balls .... *no.*	19,896	2,930	50,856	7,403
Lawn tennis balls .... *no.*	198,496	21,419	562,540	55,302
Other rubber balls ...... *no.*	255,208	11,080	1,146,480	46,746
Other rubber toys .... *lb.*	16,758	2,681	114,884	19,501
Hard rubber combs ...... *no.*	263,610	19,905	452,241	33,672
Other manufactures of hard rubber	......	4,528	......	11,234
Friction or insulating tape. *lb.*	26,705	3,464	57,096	12,121
Belts, hose, packing, and insulating material	......	1,675	......	28,939
Druggists' sundries of soft rubber	......	10,636	......	23,238
Inflatable swimming belts, floats, etc. .... *no.*	74,472	4,381	316,865	19,223
Other rubber and gutta percha manufactures... *lb.*	292,890	183,301	451,507	231,645
Totals	......	$300,345	......	$569,977

Exports of Foreign Merchandise

RUBBER AND MANUFACTURES				
Crude rubber .... *lb.*	986,343	$151,644	4,048,317	$640,699
Balata .... *lb.*	9,789	2,228	23,598	6,632
Other rubber, rubber substitutes and scrap .... *lb.*	280	42	57,193	4,116
Rubber manufactures (including toys)	......	1,604	......	3,912
Totals	......	$155,518	......	$655,359

Exports of Domestic Merchandise

RUBBER AND MANUFACTURES				
Reclaimed .... *lb.*	1,675,803	$88,203	6,457,333	$325,371
Scrap .... *lb.*	8,289,487	144,673	34,071,005	512,587
Cements .... *gal.*	49,770	70,870	157,638	204,640
Rubberized auto cloth. *sq. yd.*	16,601	10,563	56,589	30,403
Other rubberized piece goods and hospital sheeting.. *sq. yd.*	253,169	93,250	946,104	355,209
Boots .... *prs.*	3,314	8,087	35,328	78,526
Shoes .... *prs.*	32,531	13,368	82,038	37,273
Canvas shoes with rubber soles .... *prs.*	77,746	46,817	221,751	139,319
Soles .... *doz. prs.*	4,158	7,271	16,365	31,190
Heels .... *doz. prs.*	42,973	22,099	176,361	93,023
Soling and top lift sheets. *lb.*	48,827	9,256	231,914	41,684
Gloves and mittens.. *doz. prs.*	9,509	19,758	31,129	69,106
Water bottles and fountain syringes .... *no.*	25,681	8,616	82,100	28,160
Other druggists' sundries...	......	51,575	......	206,208
Gum rubber clothing.... *doz.*	22,642	74,835	116,756	243,783
Balloons .... *gross*	54,541	35,142	143,810	102,822
Toys and balls	......	16,205	......	44,528
Bathing caps .... *doz.*	7,716	15,859	24,491	49,584
Bands .... *lb.*	24,445	11,507	80,840	34,066
Erasers .... *lb.*	25,130	13,198	92,747	50,802
Hard rubber goods				
Electrical battery boxes. *no.*	10,357	9,781	69,540	49,959
Other electrical .... *lb.*	21,179	6,455	100,386	28,436
Combs, finished ...... *doz.*	22,916	10,186	49,409	27,816
Other hard rubber goods....	......	11,198	......	53,585
Tires				
Truck and bus casings. *no.*	24,309	488,197	94,933	1,889,307
Other auto casings.... *no.*	69,664	753,225	255,522	2,830,805
Tubes, auto .... *no.*	73,663	105,573	253,182	386,279
Other casings and tubes.. *no.*	8,412	72,607	29,092	220,149
Solid tires for automobiles and motor trucks.... *no.*	1,209	5,038	1,405	12,597
Other solid tires....... *lb.*	11,002	2,958	66,693	13,704
Tire sundries and repair materials .... *lb.*	185,029	56,337	684,895	208,157
Rubber and friction tape.. *lb.*	38,911	12,307	232,446	66,826
Fan belts for automobiles. *lb.*	51,492	29,921	192,252	114,006
Other rubber and balata belts .... *lb.*	328,976	179,983	1,042,710	561,739
Garden hose .... *lb.*	101 345	18,347	315,550	59,040
Other hose and tubing.... *lb.*	547,015	189,040	1,725,836	634,671
Packing .... *lb.*	120,367	51,104	413,562	182,233
Mats, matting, flooring, and tiling .... *lb.*	103,729	18,648	442,839	72,366
Thread .... *lb.*	83,844	73,454	240,807	210,972
Gutta percha manufactures. *lb.*	247,433	75,363	527,165	156,308
Other rubber manufactures..	......	137,715	......	443,222
Totals	......	$3,068,589	......	$10,900,461

Dominion of Canada Statistics

Imports of Crude and Manufactured Rubber

	Twelve Months Ended December, 1937		Twelve Months Ended December, 1938	
UNMANUFACTURED	Quantity	Value	Quantity	Value
Crude rubber, etc.	80,992,738	$15,672,483	57,562,865	$8,144,296
Gutta percha .... *lb.*	15,928	10,298	13,428	6,774
Rubber, recovered .... *lb.*	14,979,900	711,893	9,469,900	493,898
Rubber, powdered, and gutta percha scrap .... *lb.*	4,054,000	85,023	5,073,600	86,409
Balata .... *lb.*	26,173	9,237	22,417	4,643
Rubber substitute .... *lb.*	481,400	110,839	324,900	66,411
Totals	100,550,139	$16,599,773	72,467,110	$8,802,431
PARTLY MANUFACTURED				
Hard rubber comb blanks...	......	$9,572	......	$8,258
Hard rubber, n. o. s..... *lb.*	66,272	43,071	35,790	21,252
Rubber thread not covered. *lb.*	50,170	36,861	45,338	33,800
Totals	116,442	$89,504	81,128	$63,310
MANUFACTURED				
Bathing shoes .... *pairs*	33,030	$7,870	71,848	$15,089
Belting	......	111,102	......	96,033
Hose	......	105,143	......	94,370
Packing	......	75,326	......	54,456
Boots and shoes....... *pairs*	125,914	101,068	31,212	23,702
Canvas shoes with rubber soles .... *pairs*	126,388	36,142	115,537	36,785
Clothing, including waterproofed	......	37,381	......	41,969
Raincoats .... *number*	9,054	34,962	18,392	58,191
Gloves .... *dozen pairs*	4,205	11,420	4,908	13,336
Hot water bottles..........	......	25,642	......	11,843
Liquid rubber compound....	......	54,704	......	71,147
Tires, bicycle ...... *number*	116,959	48,516	142,217	68,296
Pneumatic .... *number*	24,149	265,284	21,522	242,559
Inner tubes ...... *number*	5,992	12,487	5,784	13,058
Solid for automobiles and motor trucks.... *number*	545	23,697	343	14,452
Other solid tires.........	......	17,267	......	12,498
Mats and matting..........	......	61,004	......	54,647
Cement	......	84,504	......	75,371
Golf balls .... *dozens*	33,941	75,112	31,449	67,442
Heels .... *pairs*	160,787	5,812	48,081	2,882
Other rubber manufactures.	......	1,595,236	......	1,355,958
Totals	......	$2,789,679	......	$2,424,084
Totals, rubber imports..	......	$19,478,956	......	$11,289,825

Exports of Domestic and Foreign Rubber Goods

	Produce of Canada Value	Reexports of Foreign Goods Value	Produce of Canada Value	Reexports of Foreign Goods Value
UNMANUFACTURED				
Waste rubber	$146,342	......	$76,855	......
MANUFACTURED				
Belting	$819,353	......	$618,745	......
Canvas shoes with rubber soles	935,381	......	945,776	......
Boots and shoes..........	4,577,098	......	3,524,635	......
Clothing, including waterproofed	382,129	......	453,151	......
Heels	193,925	......	168,685	......
Hose	215,319	......	246,595	......
Soles	214,923	......	166,624	......
Tires, pneumatic	8,722,371	......	7,232,942	......
Not otherwise provided for	350	......	110	......
Inner tubes	755,328	......	671,610	......
Other rubber manufactures.	802,154	$53,810	798,814	$54,363
Totals	$17,618,331	$53,810	$14,827,687	$54,363
Totals, rubber exports..	$17,764,673	$53,810	$14,904,542	$54,363

Imports by Customs Districts

	April, 1939 *Crude Rubber		April, 1938 *Crude Rubber	
	Pounds	Value	Pounds	Value
Massachusetts	7,907,513	$1,262,859	5,222,963	$816,939
Buffalo	54,000	11,200	......	......
New York	37,658,159	5,766,874	52,693,149	7,051,880
Philadelphia	918,261	128,945	1,341,980	205,596
Maryland	2,116,521	281,867	1,382,639	188,390
Virginia	......	......	336,000	44,720
Georgia	1,141,089	167,525	......	......
Mobile	1,650,367	248,481	427,561	54,536
New Orleans	8,471,279	1,293,959	6,671,729	909,997
Galveston	67,262	10,246	22,455	3,312
El Paso	179,800	3,530	......	......
Los Angeles	10,717,213	1,482,237	2,901,524	412,479
San Francisco	788,382	115,901	632,200	92,878
Oregon	11,200	1,960	17,920	2,688
Ohio	400	194	297,623	58,174
Colorado	67,200	9,670	......	......
Totals	71,748,646	$10,785,448	71,947,743	$9,841,589

*Crude rubber including latex dry rubber content.